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ENVIRONMENTAL PROTECTION AGENCY

TECHNICAL ENFORCEMENT SUPPORT
AT
HAZARDOUS WASTE SITES

TES IV

CONTRACT NO. 68-01-7351
WORK ASSIGNMENT NO. 667

146A

FINAL
RCRA FACILITY ASSESSMENT REPORT

FOR

MONSANTO-QUEENY PLANT
1700 SOUTH SECOND STREET
ST. LOUIS, MISSOURI
EPA ID. NO. MOD004954111

PREPARED BY
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PROJECT NO. 05-B667-00

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1.0 INTRODUCTION

This report documents the Preliminary Assessment (PA) portion of the Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) for the Monsanto-Queeny Plant of the Monsanto Chemical Company, located in St. Louis, Missouri. The objectives of an RFA are to identify and gather information on releases at RCRA regulated facilities, to evaluate a facility's solid waste management units (SWMUs) with respect to releases of hazardous wastes or hazardous waste constituents to all media, and to determine the need for further actions and interim measures at the facility. This report combines the findings of the Preliminary Review (PR) phase and the Visual Site Inspection (VSI) phase of the RFA. Further, this report primarily addresses conditions as they now exist at the facility. Information available to Jacobs concerning historical waste generation and management practices is very limited and has necessarily restricted the historical scope of this report.

The PR has been conducted in several phases. Several visits have been made to the Waste Management Division of the Region VII Environmental Protection Agency (EPA). Files of both the RCRA and Superfund Branches have been reviewed, and in some cases, photocopied for future reference. Jacobs personnel also reviewed relevant files of the Missouri Department of Natural Resources (MDNR) in Jefferson City, Missouri and photocopied appropriate documents for future reference.

The VSI was performed by Jacobs representative Carla Rellergert and EPA representative John Smith on March 1, 1988. The inspectors met with Mr. Robert Boland, Environmental Protection Superintendent for the facility. The VSI consisted of an initial conference, followed by a tour of the site. Mr. Kenneth Kennedy, Plant Manager; Mr. Fred Mathews, General Superintendent; and Mr. Rick Koenig, Senior Environmental Protection Technician, also participated in the initial conference.

The information gathered from the PR and the VSI has been used to identify and characterize potential releases from the facility and to outline a recommended general course of action for a RCRA Facility Investigation (RFI). The findings of the PR and VSI are presented in Sections 2.0 - 8.0 of this report.

- o Section 2.0 includes a description of the facility plant operations, waste management practices, a regulatory compliance summary, and environmental setting information.

- o Section 3.0 presents a discussion of aerial photographs taken of the facility from 1956 to 1988.

- o Section 4.0 includes a location map and a listing of both regulated units and solid waste management units, in addition to other areas of concern identified by Jacobs.

- Section 5.0 includes, for each RCRA-regulated unit, a description of that unit or area; information on waste characteristics, an evaluation of migration pathways, evidence of releases, and exposure potentials.
- Section 6.0 includes for each SWMU, the same types of information presented in Section 5.0.
- Section 7.0 includes, for each area of concern, the same types of information presented in Section 6.0.
- Section 8.0 includes, for each RCRA-regulated unit, SWMU, and area of concern, recommendations for further actions to be taken.

2.0 FACILITY DESCRIPTION AND WASTES GENERATED

2.1 Facility Description

The Monsanto-Queeny Plant is located at 1700 South Second Street in St. Louis, Missouri (Figures 1 and 2). The Monsanto property covers 72 acres. Process areas have existed on a majority of this property either currently or in the past. The Queeny Plant is the location where the Monsanto Company began its operations, and manufacturing of various chemical products has been performed by Monsanto at this location since approximately 1901.

The geographic coordinates of the site are Latitude 38^{o} 35' and Longitude 90^{o} 12'. The plant is a manufacturer of a wide variety of organic chemicals. The primary product types include industrial chemicals, chemical intermediates, pesticides, and pharmaceuticals.

2.2 Facility Operation

As stated above, the Monsanto-Queeny Plant produces a wide range of chemical products through a variety of manufacturing processes. Due to the significant number and complex nature of these processes, a detailed description of such will be foregone. Relevant information, as required in discussing potential releases from the facility, will be presented, as appropriate, in the following sections of this report.

2.3 Waste Management Practices

In the RCRA Part A application, originally submitted by the facility in November 1980, Monsanto identified over 195 hazardous waste streams as being produced by the facility. The application also noted that the Monsanto-Queeny Plant had over 470 air source operations that were registered with the City of St. Louis, Missouri. Little information was available on historical waste management practices at this facility.

The quantity of waste generated at the Queeny Plant varies from year to year and is highly dependent on the volume of chemical manufacturing. In 1987, approximately 2.2 million pounds of hazardous wastes were generated. Individual waste stream generation rates are summarized in Monsanto's most recent RCRA Part A Permit application, which is attached to this report as Appendix A. Although the Part A is not an entirely accurate source of waste generation rates, it provides a general summary of this information.

In general, the current wastes managed can be grouped into ten categories:

a) distillation column bottoms,
b) other chemical residues,
c) filter cakes,
d) filter cartridges,
e) chemical floor sweepings,
f) off-specification finished goods,
g) unused raw materials,
h) discarded laboratory chemicals,
i) process wastewater, and
j) other process waste.

In general, generated hazardous wastes are managed in one of several ways. One strategy involves containerization of wastes at satellite accumulation points within the various departments of the plant. Operators in the waste generating department place the waste in the containers and are responsible for securing lids, applying all necessary labels and marking dates for when the actual storage time began. Once the drums are full and properly labeled, they are temporarily stored outside the department area to await transportation to the container storage lot. After offsite shipment of the drums is arranged, the drum pallets are moved to the KK Building loading dock where they are loaded onto trucks and shipped offsite (Reference 2).

A second method of waste management involves a piping system which transfers wastes from the point of generation to bulk storage tanks. Wastes stored in these tanks are removed periodically and transported offsite. During the April 24, 1986 inspection conducted by MDNR, a review of Monsanto's hazardous waste manifests indicated that the following facilities were being utilized as hazardous waste disposal facilities: Rollins Environmental Services, Baton Rouge, Louisiana; Rollins Environmental Services, Deer Park, Texas; and Chemical Waste Management, Inc., Emelle, Alabama.

The Monsanto-Queeny Plant operates a wastewater treatment system which is completely self-contained. In 1981, the facility completed a spill control system which routes all stormwater runoff, as well as chemical spills in production areas, to a clarifier tank, via an onsite sewer system. This system also treats process wastewater generated in production areas throughout the site. The clarifier is equipped with a "light oil" and "heavy oil" removal system which removes chemicals and places them in storage tanks to await offsite shipment. After passing through the clarifier, wastewater enters a neutralization basin for pH adjustment. After treatment is completed, all wastewater is discharged to the Metropolitan St. Louis Sewer District (MSD) and is treated in the publicly owned treatment works (POTW).

The facility maintains a thermal incinerator in the chloroacetyl chloride (CAC) department which burns liquid waste from CAC manufacturing, as well as azomethine residue from the production of herbicide. The design of this system is discussed in more detail in Section 5.4.

Periodic and normal maintenance procedures at the facility generate an oil waste, primarily from compressors throughout the plant. The oil from the compressors is drained into specially marked drums which are then pumped into a 100,000 gallon above ground storage tank.

This oil was originally burned under a certified resource recovery permit issued by the State of Missouri on December 8, 1982. On a hazardous waste compliance inspection conducted by MDNR on April 24, 1986 (Reference 3), facility representatives stated that the oil resource recovery operation had ceased in October 1983 because of problems encountered with the boiler. At the time of this inspection, Monsanto did not think that oil resource recovery would resume. However, during the VSI, Monsanto stated that the fuel oil is now burned in the package boiler (Photograph 15). The fuel oil is piped above ground to the boiler.

Finally, it is noted that the Monsanto-Queeny facility does not have a National Pollution Discharge Elimination System (NPDES) permit or a direct discharge point. Review of historical aerial photographs taken in 1956 and 1964, however, indicated a major discharge point to the Mississippi River immediately to the east of the facility. During a December 14, 1988 telephone conversation between Terry Hagen of Jacobs Engineering and Mr. Boland of Monsanto (Appendix E). Mr. Boland stated that Monsanto did operate, in the past, at least one major discharge to the river. Mr. Boland did not know the dates of operation for this unit. Based on the conversation with Mr. Boland, it is believed that the discharge point identified in the aerial photographs is the same discharge point that Mr. Boland was referring to. In addition, Monsanto's original Part B application stated that prior to rehabilitation of the facility's sewer system, a number of separate sewer systems with different discharges were in existence. Mr. Boland had no immediate knowledge of any such discharges. As stated earlier, the plant now discharges directly to the MSD, which does not operate a permitting system.

2.4 Regulatory Compliance History

The Monsanto-Queeny Plant submitted a Notification of Hazardous Waste Activity on August 14, 1980, which identified the facility as both a generator and a treatment, storage, and/or disposal facility handling F-, P-, and U- listed wastes. On November 13, 1980, Monsanto-Queeny filed a Part A Permit application, identifying their hazardous waste activity as consisting of the use of the following: a drum storage lot, an azomethine residue storage tank, an azomethine residue holding tank, a phenol residue storage tank, a spill control clarifier, a wastewater neutralization basin, a clarifier waste tank farm, a laboratory separator, and a waste incinerator. Monsanto submitted a revised Part A application on March 23, 1981 which deleted the spill control clarifier, neutralization basin, and laboratory separator due to the wastewater treatment exclusion in 40 CFR Part 265.1. In addition, several new waste streams were added to the permit. On March 10, 1982, EPA provided notice that, following review of the facility's Part A Permit application, interim status was granted to Monsanto-Queeny for the waste management activities identified in the Part A.

On April 10, 1984, MDNR and EPA jointly called the Part B Permit application, which Monsanto-Queeny submitted on November 6, 1984. On January 23, 1985 EPA issued to Monsanto-Queeny a Notice of Deficiency/Letter of Warning to formally notify the facility of deficiencies in the Part B application. MDNR submitted like notice on January 17, 1985. The facility submitted a revised Part B on March 1, 1985 which MDNR made available for public review on May 3, 1985. A second revised Part B was submitted on October 14, 1988 which included an updated Part A application. Due to other permitting priorities, the Part B has not been acted upon. A Trial Burn Plan for the CAC incinerator was included with the original Part B application, and a revised plan was submitted on June 9, 1988. This has since been reviewed by EPA and MDNR with comments forwarded to the facility. A second revision to the plan was submitted in October of 1988. Since the original Part B application submittal, Monsanto-Queeny has made several revisions to their Part A Permit application. An August 22, 1985 revision accounted for the generation of F020 and F023 wastes. The application was updated on May 1, 1986 to reflect long term storage of dioxin contaminated wastes and use of a treatment system for dioxin cleanup-derived wastewaters. In a July 29, 1988 letter to MDNR, Monsanto indicated its intention to submit a revised Part B Permit application no later than September 30, 1988. The revised Part B permit application was submitted to EPA on October 14, 1988.

On February 11, 1986, Monsanto-Queeny submitted a Closure Plan for the phenol residue tank. MDNR conditionally approved the plan on October 24, 1986, and closure was completed and certified by a registered Professional Engineer. According to EPA Region VII files, no other regulated units have undergone RCRA closure at the facility. However, it was reported in the revised Part B application that the four clarifier sludge storage tanks were "administratively removed" from the plant's interim status classification by MDNR and dismantled in 1987. The tanks never underwent RCRA closure because Monsanto claimed that they never stored a hazardous waste.

In late 1983 and early 1984, Monsanto performed wipe sampling on the interior of buildings that had been associated with the process of converting 2,4,5 trichlorophenoxyacetic acid (2,4,5-T) into esters of 2,4,5-T. 2,3,7,8 - tetrachlorodibenzo-p-dioxin (dioxin) is a low level contaminant that is typically associated with 2,4,5-T. Results of the initial sampling and analytical program indicated that dust on the surface of four buildings (Q, QQ, WW, and AA) at the site was contaminated with dioxin at levels of approximately 25 parts per billion (ppb) and below (Reference 4).

Monsanto initiated cleanup of these buildings on March 26, 1985, according to the Cleanup Proposal approved by EPA. The cleanup was completed on May 3, 1985. Further analysis of sampling results indicated dioxin concentrations up to 2.0 ppb in building ZZ. Likewise, this building was decontaminated in October of 1986. Wastes generated from this cleanup are presently stored onsite (See Section 5.6). These are the wastes for which the application for a long-term storage permit was submitted. It is Jacobs Engineering's understanding that the decontaminated buildings have been demolished and the rubble has been disposed of in a sanitary landfill. During a telephone conversation between Mr. Terry Hagen of Jacobs Engineering Group and Mr. Robert Boland of Monsanto on November 15, 1988, Mr. Boland stated that the buildings were demolished in 1986. Individual buildings were demolished at different times throughout the year and the rubble was disposed of in sanitary waste landfills in East St. Louis and Belleville, Illinois (Appendix E).

Monsanto has conducted a series of hydrogeologic investigations at the facility, beginning in August of 1983. During a portion of these investigations, free phase tetrachloroethylene (perchloroethylene [PCE]) was detected in an underground utility manhole in the vicinity of building FF (Reference 1). This is discussed in more detail in Section 7.2. To aid in remediation of this problem, in January of 1987 Monsanto installed four PCE recovery wells (REC 1-4, Figure 3). It is Jacobs' understanding that these wells are still in operation. Monitoring wells in the Lasso Production Area have also shown significant contamination. Contaminants of concern include alachlor, chlorobenzene, 2,6-diethylaniline, and acetyl alachlor. This contamination is discussed in more detail in Section 7.4.

MDNR has conducted several RCRA Compliance Inspections at Monsanto-Queeny. In general, these inspections have shown Monsanto-Queeny to be in compliance with applicable federal and state regulations pursuant to RCRA and the Missouri Hazardous Waste Management Law. Violations noted during the inspections have concerned incomplete manifests or noncompliance with State reporting requirements. A report for an inspection conducted on April 24, 1986, (Reference 3) noted that Monsanto had not revised their Part A application to reflect incineration of the azomethine residue in the CAC incinerator.

An additional violation noted in this report was the fact that the facility's Contingency Plan did not have the home addresses of emergency coordinators as required by 40 CFR 265.52 (d).

A check with the EPA Region VII Water Management Division revealed that they had no information concerning Monsanto's water compliance history. As noted earlier, Monsanto does not have an NPDES permit. The MSD noted that Monsanto had several violations for the pH level of wastewaters entering their system. The MSD had no information concerning direct discharge points to the Mississippi River.

As mentioned earlier in the report, the Monsanto-Queeny Plant has over 470 air source operations that are registered with the City of St. Louis, Missouri. Jacobs Engineering contacted the EPA Region VII Air and Toxics Division to ascertain any major items in the plant's air compliance history. Particular attention was paid to inspection reports and any resulting notices of violation.

An August 22, 1984 inspection performed by EPA noted that volatile organic air emissions from an aspirin dryer in the plant were in violation of state emission limits. A Notice of Violation was issued to the facility at this time. A June 19, 1987 Letter of Violation was issued to Monsanto for violations of federal Standards of Performance for New Stationary Sources. Specifically, Monsanto began operation of an oil-fired packaged industrial boiler in November of 1986. Monsanto failed to perform required performance tests for nitrogen oxide monitors within 180 days of startup. A Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 114 Order was issued on November 6, 1987, which required Monsanto to perform the tests.

It was noted during review of inspection reports that the City of St. Louis periodically inspects Monsanto for adherence to air emission standards and that the facility has maintained general compliance with these regulations.

2.5 ENVIRONMENTAL SETTING

2.5.1 Adjacent Land Use

The Monsanto-Queeny Plant is located in a heavily industrialized area of St. Louis, Missouri. The facility is surrounded on all sides by businesses which are primarily industrial in nature. A residential neighborhood is located approximately three blocks to the west of the facility. The Mississippi River lies approximately 500 feet to the east of the facility boundary. Despite the close proximity of the river, the facility is not located within the 100 year floodplain. A flood wall separates the facility from the Mississippi River.

2.5.2 Climate

The St. Louis, Missouri area receives an average of approximately 34 inches of precipitation a year. The 1987 meteorological data collected at Lambert International Airport in St. Louis recorded a maximum temperature of 103^{o} F and a minimum temperature of 2^{o} F. The average prevailing wind direction for the year was from the south at approximately 10 mph.

2.5.3 Geology/Hydrogeology

Information on geology was from two major references obtained by Jacobs Engineering. These references are:

- o Review of Hydrogeologic Investigations at the J. F. Queeny Plant; Geraghty & Miller, Inc., June 1988 (Reference 1).
- o Geologic and Subsurface Investigation of the St. Louis, Missouri Metropolitan Area; William Eldon Saeger, May 1975 (Reference 5).

Geology

The Monsanto-Queeny Plant lies in an area characterized by unconsolidated alluvial deposits overlying sedimentary rocks. The unconsolidated deposits in the vicinity of the site are comprised of predominantly fine to coarse-grained sand and gravel, with local discontinuous layers of silt and clay. The alluvium rests on limestone that is of the Meramecian series and is Mississippian in age.

The site-specific stratigraphic units across the facility are documented only to the uppermost bedrock layer. This information has been supplemented with regional geologic information to produce the stratigraphic profile described below.

Unit 1 - Fill Layer: This layer is present across a majority of the site and is characterized by a variety of materials including slag, crushed limestone, brick, silty soil, and sand. This unit ranges in depth from the ground surface to as much as 17 feet below ground surface (Figure 4).

Unit 2 - Silt/Clay Layer: This layer is present throughout the site. The material is generally characterized as a gray and brown silty clay and clayey silt. Thicknesses across the site range from five to forty feet. In an area in the southern portion of the facility where bedrock is found at shallow depths, this layer rests directly on bedrock.

Unit 3 - Sand/Gravel Layer: This layer is found in the portions of the site where bedrock is encountered at greater depths. This layer is primarily characterized by fine grained silty sand, but does include occasional areas of sandy gravel. The thickness of this unit ranges from 0 feet to 45 feet throughout the site.

Unit 4 - Silt/Clay/Silty Sand Layer: This layer is found in the northern portion of the facility. This layer consists of various "sub-layers" of silt, clay, and silty sand constituents. Across the site this layer ranges from less than one foot to 30 feet in thickness.

Unit 5 - Bedrock: The uppermost bedrock encountered beneath the site is limestone. The bedrock surface is irregular as evidenced by the varying depths to bedrock throughout the facility (Figure 4). In the southern portion of the plant, depth to bedrock is as little as ten feet, while it is in excess of 85 feet in the northern portion of the site.

It has been reported that a limestone quarry of unknown depth existed in the extreme southeastern portion of the facility. Boring logs for wells completed in this area indicate that the quarry has been filled with native unconsolidated material and fill material, such as foundry slag, bricks, concrete, etc. Borings in this area extended up to 83 feet below ground surface and did not encounter bedrock.

Hydrogeology

The uppermost aquifer system is an unconfined aquifer in the unconsolidated deposits and appears to extend from the water table to the bedrock surface. Slug testing conducted by Environmental Science and Engineering , Inc. (ESE) as part of a previous hydrogeologic investigation, yielded an estimate for average hydraulic conductivity of 2×10^{-5} feet/second (Reference 1). Hydraulic conductivities of this order of magnitude are commonly associated with silts and silty sands. Using this approximation, estimates of porosity, and groundwater elevation data, Monsanto has calculated maximum and minimum lateral groundwater flow velocities of 0.5 feet/day and 0.06 feet/day, respectively.

Groundwater elevations in monitoring wells throughout the site have yielded information concerning groundwater flow patterns at the facility. Depths to the water table across the facility range from approximately five feet to as much as 30 feet (Figures 5 and 6 provide representations of the groundwater elevation contours, possibly reflecting seasonal influence). Groundwater elevations measured in April of 1985 showed a mounding of the water table in the southern portion of the facility. This mound was not seen in data collected during September of 1987. Monsanto has said that the mound may be explained by seasonal effects in conjunction with the shallow depth to bedrock in that area. Monsanto reports that although there are local components of flow, the horizontal flow direction is generally to the east with groundwater ultimately discharging into the Mississippi River.

Monitoring Wells

Groundwater monitoring wells have been installed on Monsanto property as part of several hydrogeologic investigations at the facility. Sixteen wells were installed in 1983 under the supervision of ESE, and 12 more were added the following year to fill data gaps. Many of these wells were installed as two-well clusters. In 1985, ESE installed three monitoring wells near the FF building to investigate a perchloroethylene release. In a separate investigation initiated in 1986 by Geraghty & Miller, several soil borings and five monitoring wells were installed in the Lasso Production Area.

Monitoring well locations are shown in Figure 3. Available geologic borehole logs and well construction information is presented in Appendix B. Thirty-four wells have been installed throughout the facility. Many of these monitoring wells were installed in clusters with two wells tapping different intervals within the aquifer. In addition, several soil borings have been completed at different locations within the facility boundaries.

A discussion of specific monitoring wells and chemical data will be included as appropriate in the discussion of individual solid waste management units.

2.5.4 Surface Water Drainage

In 1981, Monsanto completed a facility-wide spill control system which was designed not only to contain chemical spills in production and storage areas, but also to collect stormwater runoff from the site. In general, the system consists of a self-contained sewer network which collects spills and stormwater runoff.

Review of a schematic depicting Monsanto's storm/spill drain and sewer piping system indicates that surface water drainage is directed to storm drains located throughout the facility. Water is directed through the plant's wastewater treatment system and is then discharged to the St. Louis MSD. It is noted that the facility itself is not surrounded entirely by a diking or curbing system.

Information concerning site drainage prior to 1981 is sketchy; however, a number of separate sewer systems with separate discharge points were believed to exist. No information is available pertaining to the location of these discharge points with the exception of the discharge point noted in the aerial photographs. The plant does not have any NPDES permitted discharges. Review of the facility's natural topography indicates that surface water drainage from this site would flow generally to the east plant-wide, with local exceptions.

2.5.5 Water Use

Jacobs Engineering contacted the Missouri Geological Survey (MGS) to obtain information on domestic and/or industrial wells completed within a one mile radius of the Monsanto-Queeny Plant. No drinking water wells were identified. Nine industrial wells were identified within this radius, all of which were completed in excess of 400 feet below ground surface.

Water which is used at the Monsanto-Queeny Plant is supplied by the City of St. Louis' water supply system. This general system serves the entire City of St. Louis. The source of water for the city system in the vicinity of the facility is the Mississippi River. The intake is located off Riverview Drive, approximately five miles north (upstream) of the site. The city water supply intake for East St. Louis, Sauget, and Cahokia, Illinois is located over 1.5 miles upstream of the Monsanto facility (Appendix E). No water intakes have been identified in the St. Louis area downstream of Monsanto.

3.0 DISCUSSION OF AERIAL PHOTOGRAPHS

Eight aerial photographs were obtained to help evaluate the historical management of the Monsanto facility and to help document past waste management. Two of these photographs were supplied to Jacobs by Monsanto and the other six were obtained from the Surdex Corporation who had them on file for the U.S. Army Corps of Engineers, St. Louis District. The dates of these photographs range from 1956 to 1988. Following is a discussion of these aerial photographs, which are included in this report as Appendix F.

1956:

The 1956 photographs are oblique view photos taken of the Monsanto facility. What appears to be a discharge point into the Mississippi River may be emanating from the Monsanto facility on an approximate line with Lesperance Street (Location No. 1; first photograph). Discoloration appears to be present at the discharge point. Note the foundry at Location No. 2. Monsanto purchased this property in 1953 and was leasing the property to American Car Foundry at the time of this photo.

In the second photograph, Location No. 3 appears to be dismantled tank storage and Location No. 4 appears to be drum storage.

1964:

The discharge point noted in the 1956 photograph is present in the 1964 photograph (Location No. 1) and appears to be discharging significant amounts of liquids at the time the photograph was taken. The American Car Foundry is no longer present. A metal reclaiming operation at the former quarry location appears to be ongoing at Location No. 2 during this time period.

1969:

The metal reclaiming operation at the former quarry (Location No. 1) appears to be still active. The discharge point is no longer distinguishable.

1975:

The flood wall has been built, as indicated on the overlay. The discharge point may still be operating (Location No. 1).

4.0 LOCATIONS OF RCRA-REGULATED UNITS, SOLID WASTE MANAGEMENT UNITS, AND AREAS OF CONCERN

The Monsanto-Queeny Plant is responsible for six RCRA-regulated units and ten solid waste management units (SWMUs) as identified by the facility in various RCRA applications and responses to RCRA 3007 Information Request Letters and also as identified during the VSI. In addition, several areas of concern have been identified which may not meet the definition of a SWMU. Locations of the regulated units, SWMUs and areas of concern are presented in Figures 7, 9, and 10, respectively. A list of the units shown therein is presented before each figure.

5.0 RELEASE INFORMATION FOR RCRA-REGULATED UNITS

Information regarding the RCRA regulated units at the Monsanto-Queeny Plant, was obtained from several sources including:

- o RCRA Part B Permit Application, Monsanto-Queeny Plant November 7, 1984 (Reference 2).
- o Revised RCRA Part B Permit Application, Monsanto-Queeny Plant, October 14, 1988.
- o Historical aerial photographic analysis, 1956-1988 (Appendix C).
- o Trial Burn Plan, Monsanto-Queeny Plant CAC Incinerator; by James A. Peters - Terran Corporation, May 1988 (Reference 6).
- o Observations by the EPA and Jacobs representatives during the VSI, March 1, 1988. Field Logbook attached as Appendix D.

- o Observations by the EPA and Jacobs representatives during the VSI, March 1, 1988. Field Logbook attached as Appendix D.
- o Telephone conversations between representatives of Jacobs Engineering and Monsanto (Appendix E).
- o Correspondence between EPA and Monsanto concerning the subject units.

5.1 Unit 1: Azomethine Residue Storage Tank

5.1.1 Description

This tank is utilized solely for the storage of azomethine residues produced in the alachlor (herbicide) manufacturing department. Residues are stored in this tank before entering the holding tank which feeds waste to the CAC incinerator (the holding tank and the incinerator will be described in more detail in later sections). The location of the tank is shown in Figure 7. This tank is located outside and is above ground. During the telephone conversation of November 15, 1988, Mr. Boland stated that, offhand, he did not know the age of this tank. He stated that this information may be in the letter addressed to Ms. Carla Rellergert of Jacobs Engineering, dated March 23, 1988; however, this information was not contained in the letter. As reported by Monsanto in their original Part B Permit application, the tank's physical characteristics are as follows:

Capacity: 18,000 gallons
Height: 21'
Diameter: 10'
Thickness: 1/4"
Material of Construction: Carbon Steel
Design Pressure Rating: 40 psi
Operating Temperature: 25-30^{o}C
Operating Level: 0-50% (< 9,000 gallons)

This tank is fed by an above ground piping configuration. The tank is equipped with a high level alarm that sounds at the 90% level (16,200 gallons). In addition, an interlock is in place that shuts the pump off automatically just slightly above this level. All controls for the tank are in the department control room; however, remote switches are also located in the field.

The tank rests on a concrete pad. A concrete diking system with a concrete floor is in place that contains all leaks and spills from this unit. Leaks and spills are directed to the plant's wastewater treatment system.

5.1.2 Waste Characteristics

In a proposed Closure Plan for this unit, Monsanto has specified the chemical composition of the azomethine residue to be as follows:

2,6 - Diethyl Phenyl Azomethine: 20-25%
2,6 - Diethylaniline: 5-10%
TEA Salts of S-593: 55-60%
Formaldehyde: 1-5%
Kerosene: 0-15%

In the past, Monsanto reported that this waste reacted with water and thus, may have exhibited the characteristic of reactivity. In the most recent Part B submittal, Monsanto states that this waste is no longer reactive. This is due to a stabilizing agent that is added during the production process from which this waste is generated. Formaldehyde is a 40 CFR Part 261 Appendix VIII hazardous constituent. Kerosene may also contain Appendix VIII constituents.

5.1.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

Potential for releases to surface water from the tank is currently minimal due to the diking system which is designed to contain any spills or leaks from the unit.

Soils

Potential for releases to soil from the tank are currently considered to be minimal due to the concrete pad and diking system that serves as a spill containment system for this unit.

Groundwater

Due to the spill containment associated with this unit as described above, the potential for releases to groundwater is currently considered to be minimal.

Soil Gas

There does not currently appear to be a potential for subsurface gas migration/release from this unit.

Air

A review of engineering drawings (Reference 2) for the tank indicates that it can be vented, allowing for the possibility of an air release of any volatile constituents in the waste.

5.2 Unit 2: Azomethine Residue Holding Tank

5.2.1 Description

This unit is designed to temporarily store azomethine residues immediately prior to injection into the CAC incinerator. The holding tank's location is shown in Figure 7. This tank is located outside and above ground and was manufactured in 1976.

As reported by Monsanto in their original Part B Permit application, the tank's physical characteristics are as follows:

Capacity: 6,000 gallons
Height: 16'
Diameter: 8'
Thickness: 1/4"
Material of Construction: Carbon Steel
Design Pressure Rating: 40 psi

Operating Temperature: 25-30^{o}C
Operating Level: Varies 0-75%

The tank is equipped with a high level alarm that sounds at the 90% level (5,400 gallons). In addition, an interlock is in place that shuts off the feed pump automatically just slightly above this level. All controls for the tank are in the CAC department control room; however, remote switches are also located in the field. The tank is located on a concrete pad which is curbed with all drainage directed to the plant's wastewater treatment system.

Monsanto performed a written assessment of the tank's structural intergrity as required by 40 CFR 264.191. The assessment judged the tank to be fit to store the azomethine wastes and was certified by an independent registered professional engineer. The assessment was based on a November 5, 1987 inspection of both the interior and exterior of the tank.

5.2.2 Waste Characteristics

As noted above, this unit handles the same wastes as does the azomethine residue storage tank. This waste contains formaldehyde, an Appendix VIII waste, and kerosene, which likely contains Appendix VIII constituents.

5.2.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

The potential for releases to surface water from the tank is currently considered to be minimal due to the curbing and concrete floor around the tank designed to contain any spills or leaks.

Soils

Releases to soil from the tank are currently considered to be minimal due to the concrete pad and floor and diking system that serves as a spill containment system for this unit.

Groundwater

Due to the spill containment associated with this unit as described above, the potential for releases to groundwater is currently considered to be minimal.

Soil Gas

There does not currently appear to be a potential for subsurface gas migration/release from this unit.

Air

A review of engineering drawings indicates that the tank is vented, introducing the possibility of an air release of any volatile constituents contained in the wastes.

5.3 Unit 3: Chloroacetyl Chloride (CAC) Liquid Waste Storage Tank

5.3.1 Description

This unit is utilized solely for storage of a liquid waste produced in the CAC manufacturing department. The wastes are pumped from the points of generation to the tank via above ground piping. The unit serves as a feed tank for the injection of wastes into the CAC incinerator. This tank is located outside any buildings and is above ground (see Figure 7 for location).

As reported by Monsanto in their original Part B Permit application, the tank's physical characteristics are as follows:

Capacity: 12,500 gallons
Height: 20'3"
Diameter: 10'
Thickness: 1/4"
Material of Construction: Carbon steel, glass lined
Design Pressure Rating: 40 psi
Operating Temperature: Ambient
Operating Level: Varies 0-50%
Construction Date: 1975

The tank is equipped with a high level alarm that sounds at the 90% level (11,250 gallons). In addition, an interlock is installed that shuts the pump off automatically just slightly above this level. The tank level is monitored closely, as the stored material is burned directly in the department incinerator. The CAC liquid waste is corrosive; however, the glass lining protects the tank's material of construction. The tank rests on a concrete pad which is curbed, with all drainage directed to the plant's wastewater treatment system.

Monsanto performed a written assessment of this unit's structural integrity, as required by 40 CFR 264.191. This assessment declared the tank to be fit to store the CAC waste and was certified by an independent registered professional engineer. This assessment was based on a November 5, 1987 inspection of both the interior and exterior of the tank.

5.3.2 Waste Characteristics

As reported in Monsanto's Trial Burn Plan for the CAC incinerator, dated May 1988, the physical and chemical characteristics of the CAC waste are as described in Table 1.

Monsanto has determined this waste to be a D002 and D003 hazardous waste due to corrosivity and reactivity, respectively. The waste also contains the following contaminants listed in 40 CFR Part 261 Appendix VIII: ethylene dichloride; carbon tetrachloride; tetrachloroethane, N.O.S.; chloroform; dichloromethane; dichloropropene, N.O.S.; and acetyl chloride.

5.3.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

The potential for releases to surface water from the tank is minimal due to the surrounding curbing which is designed to contain any spills or leaks from the unit.

Soils

The potential for releases to soil from the tank is currently considered to be minimal due to the concrete pad and curbing that serves as a spill containment system for this unit.

Groundwater

Due to the spill containment associated with this unit as described above, the potential for releases to groundwater is currently considered to be minimal.

Soil Gas

There does not currently appear to be a potential for subsurface gas migration/release from this unit.

Air

A review of engineering drawings (Reference 2) for this tank indicates that the tank can be vented, introducing the possibility of a release to air of the volatile constituents in the CAC waste.

5.4 Unit 4: CAC Incinerator

5.4.1 Description

This unit, which has been in existence since 1976, is a thermal incinerator (Photographs 17, 18, 19) located in the CAC manufacturing department (Figure 7), which burns waste from the CAC manufacturing process and azomethine residue from the alachlor manufacturing process. During the telephone conversation of November 15, 1988, Mr. Boland stated that the alachlor production process predates the installation of the incinerator and that these wastes were sent offsite for incineration until 1985.

The incinerator is designed as a combination liquid injection and gas thermal oxidizer, consisting of a horizontal burner plenum, vertical oxidizer chamber, water quench pot, and water absorber (scrubber). A schematic of the incinerator is given in Figure 8. The two waste streams are fed to the incinerator by separate steam-atomized firing nozzles (Reference 2). Additional fuel (natural gas) is fed to the thermal gas oxidizer as needed to facilitate complete burning of the waste and to maintain adequate combustion temperatures. Combustion air is supplied to the combustion chamber by a process blower. The resulting combustion gases exit the burning chamber and pass through a quench pot where they are cooled by a water spray, using city water. These gases continue beyond the quench system and enter a packed water absorber (scrubber) system before being discharged to the atmosphere. All water used for the quench and scrubber system is "once through" city water (although scrubber water may be recycled to the quench pot) and is discharged to the plant sewer system for eventual treatment.

The incinerator operating conditions, as described in Monsanto's Part B application and revised Trial Burn Plan, are as follows:

Burning Chamber Temperature: $900^{o}C$ - $1080^{o}C$
Normal Retention Time: 1.2 seconds
Air Flow Rate: 2500 acfm
Quench Water Flow Rate: 75 gpm
Scrubber Water Flow Rate: 190 gpm

Instrumentation is, or will be put, in place which continuously monitors for combustion temperature, waste feed rate, combustion gas velocity, and carbon monoxide in the gas discharge stack. These are recorded on the strip charts in the department control room which are continuously monitored by the department operators. In addition, operators check the incinerator three times each 8-hour shift for any signs of leaks, spills, fugitive emissions or other related problems. The incinerator is located on a paved portion of the plant with curbing on three sides of the unit and any spills and leaks are directed to the wastewater treatment system.

5.4.2 Waste Characteristics

The incinerator burns two wastes streams separately: CAC residue wastes and azomethine residue wastes. Refer to Sections 5.1.2 and 5.3.2, respectively, for discussions of the waste characteristics of these waste streams.

5.4.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

The potential for a direct release to surface water from the unit is currently considered to be minimal due to the facility's self-contained drainage system and due to the treatment of this water in the wastewater treatment system and MSD before discharge to a surface water body.

Soil

Because this unit has rested on pavement since its installation, as reported during the VSI, and also due to the spill containment associated with this unit, the potential for a release to soil is currently considered to be minimal.

Groundwater

Due to the pavement and spill containment associated with this unit, the potential for a release to groundwater is currently considered to be minimal.

Soil Gas

There does not currently appear to be a potential for subsurface gas migration/release from this unit.

Air

Combustion gases from the incinerator are discharged to the atmosphere 50 feet above ground after passing through a quench system and a packed scrubber system. Analytical data detailing the exact composition of the stack discharge are not available. When Monsanto conducts the Trial Burn for this unit, following Trial Burn Plan approval by EPA and MDNR, this information will become available, allowing further analysis of this migration pathway. The probability of air releases associated with this unit is currently judged to be minimal.

5.5 Unit 5: Container Storage Lots

5.5.1 Description

This section will describe three container storage lots: the interim status storage lot described in Monsanto's original RCRA Part B Permit application, a temporary lot used by the facility during construction of a permanent storage lot and the permanent lot now in use.

The lot described in the original Part B application was a 90 by 90 foot area area located west of the former location of the ZZ building (See Figure 7). It is unknown when operation of this unit began. The lot was utilized to store drummed hazardous wastes on wooden pallets prior to transportation offsite for disposal. This lot was a centralized storage area for wastes that were produced throughout the facility. The lot was of a concrete base with asphalt lining. Although no diking was provided at the lot, all surface drainage was directed to the plant's self-contained drainage and wastewater treatment system. This storage area is reported in the revised Part B application to have been administratively removed from interim status and dismantled in 1987. During the VSI, it was noted that this lot was no longer in existence.

The second lot, as observed during the VSI, was a temporary storage area being used in place of the closed lot while the new permanent storage lot was being constructed to the north of this location (see Photograph 6, and Figure 7 for location). This lot was similar in size to the first lot and drums were stored in a similar manner as in the first. This area was paved and Monsanto stated that it was inspected daily and checked for spills or leaks. Although no diking was associated with this area, if any such spills or leaks were found, corrective action was to be taken immediately. Drainage from this area was also directed to the facility's drainage and wastewater treatment system.

As reported in the revised Part B application submitted in October 1988, the new container storage lot is approximately 31 feet in width and approximately 49 feet in length. The lot is at least fifty feet from the nearest property line, which is located to the west. The lot floor is constructed of reinforced concrete with a load bearing capacity of at least 50,000 pounds per axle. It has a storage capacity of 500 containers when triple stacking is used and aisle spacing of four feet is maintained between adjacent drum rows. The lot has a fiberglass roof as well as north and south concrete walls and curbs. Signs are present on the open east and west ends which denote that hazardous materials are stored at this location.

The floor is sloped to the approximate center of the south wall. A plugged drain is located at the low spot. All liquids falling on the lot flow to this point. All surfaces adjacent to the lot are reported to be sloped away to prevent precipitation run on. The drain outlet is reported to be equipped with a leak-tight shutoff valve normally locked in the closed position. The drain ultimately discharges to the plant sewer system. The sloped floor has a liquid capacity in excess of 1700 gallons which is equivalent to thirty-one full 55 gallon drums. Plant waste profile and management practices are designed to limit drummed liquid storage to this available containment capacity. All drums are stored on pallets which are to prevent contact of containers in storage with rainwater or spilled liquids. The section describing the frequency of inspection of the container storage lot has been omitted from the revised Part B application.

5.5.2 Waste Characteristics

These lots handle/handled wastes generated from a wide variety of chemical production processes throughout the plant and, thus, the characteristics of the wastes stored here are highly variable. During the April 24, 1986 Hazardous Waste Compliance Inspection conducted by MDNR (Reference 3), the following wastes were in storage at the former lot: waste benzyl benzoate cakes, DCA still residues, aspirin floor sweepings, PNPT cartridges, maleic anhydrite floor sweepings and laboratory solids were being stored in 35 gallon fiber drums. Waste lab solids containing phenol, PCE still residues, solvent column packings and waste hydraulic fluids were being stored in 55 gallon steel drums. Waste PNPT cartridges and aspirin floor sweepings were also being stored in 20 gallon fiber drums. Waste #6 fuel was being stored in 55 gallon steel drums placed in salvage drums. Waste methyl glyoxylate was being stored in 20 gallon carboys.

5.5.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

Due to the containment associated with these lots in the form of the plant's drainage and wastewater treatment system, the potential for a direct release to surface water from these units is considered to be minimal.

Soils

Due to the pavement and spill containment associated with the lots, the potential for direct release to soils is currently considered to be minimal. This conclusion assumes, however, that containment, as described above, has always been associated with the former units. The former units' containment history has not been verified. If information is obtained indicating that containment has not always been associated with the operation of the lots, re-evaluation of the above conclusion would be required.

Groundwater

As with soils, due to the containment associated with the lots, the potential for release to groundwater is currently considered to be minimal. Again, however, if information is revealed indicating that the units operated without containment, re-evaluation of the above conclusion would be required.

Soil Gas

The potential for subsurface gas migration/release from this unit is currently believed to be low. However, if soil has been contaminated by releases from the lots, the potential for subsurface gas generation would exist.

Air

The potential exists for release to air of any volatile constituents of spills which may occur.

5.6 Unit 6: Container Storage Building

5.6.1 Description

The container storage building is a fully enclosed warehouse used to store wastes derived from the second phase of a cleanup of buildings contaminated with trace amounts of dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin). See Figure 7 for the location of this warehouse. During the VSI, it was indicated to Jacobs that wastes were still being stored in this building.

The information on this unit, as presented below, was obtained from a letter written by Kenneth Perica, of Monsanto-Queeny, to John Doyle, of MDNR, dated May 1, 1986, (Reference 9) describing the intended use of this unit.

The referenced cleanup involved hydroblasting the building's internal surfaces, collection and onsite treatment of resulting wastewater prior to discharge and storage of solid residues and related debris prior to offsite incineration. The wastes that are stored in the warehouse can be categorized as one of the following:

a) Debris from the actual cleanup, such as dirt and sand from the hydroblasting of the building surfaces.

b) Sediment, sludges, sand, and carbon media from the wastewater treatment process.

c) Used personal protective gear and related debris generated during the cleanup.

The wastes were placed in 25 gallon fiber containers which are sealed. These containers were then placed inside 55 gallon steel drums. The drums are placed on wooden pallets within a diked area approximately 32 feet by 32 feet in size.

5.6.2 Waste Characteristics

The principal contaminant of concern is dioxin (2,3,7,8 - tetrachlorodibenzo-p-dioxin). This particular compound is reported to be among the most toxic in the family of dioxin chemicals and is a suspected human carcinogen. Tetrachlorodibenzo-p-dioxins are listed as 40 CFR Part 261, Appendix VIII hazardous constituents. The contaminated materials contained in this building are considered an F020 listed RCRA hazardous waste under 40 CFR 261.31. The F020 listed wastes are described as wastes from the production or manufacturing use of tri- or tetrachlorophenol, or of intermediates used to produce their pesticide derivatives. The dioxin which is of concern at the Monsanto facility is a by-product from the production of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), which is a herbicide used to control woody plants. The production of 2,4,5-T is prepared from 2,4,5-trichlorophenol and monochloroacetic acid (Reference 11).

5.6.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

Due to the containment associated with this unit, including the double-drumming of wastes, diking around the immediate storage area, and the totally enclosed area in which the storage area is located, there does not appear to be a potential for a release to surface water from this unit.

Soils

Due to the containment associated with this unit, as described above, there does not appear to be a potential for a release to soils from this unit.

Groundwater

Due to the containment associated with this unit, as described above, there does not appear to be a potential for a release to groundwater from this unit.

Soil Gas

There does not appear to be a potential for subsurface gas migration/release from this unit.

Air

There does not appear to be a potential for a release to air from this unit.

6.0 RELEASE INFORMATION FOR SOLID WASTE MANAGEMENT UNITS

Information regarding the Solid Waste Management Units (SWMUs) at the Monsanto-Queeny Plant was obtained from several sources including:

- RCRA Part B Permit Application, Monsanto-Queeny Plant, November 7, 1984 (Reference 2).
- Historical aerial photographic analysis, 1956-1988 (Appendix C).
- Trial Burn Plan, Monsanto-Queeny Plant CAC Incinerator; by James A. Peters - Terran Corporation, May 1988 (Reference 6).
- Observations by the EPA and Jacobs representatives during the VSI, March 1, 1988. Field Logbook attached as Appendix D.
- Telephone conversations between representatives of Jacobs Engineering and Monsanto (Appendix E).
- Correspondence between EPA and Monsanto concerning the subject units.

6.1 Unit 1: Pump Pit

6.1.1 Description

The pump pit (See Photograph 10 and Figure 7 for location) is a wastewater diversion structure built in 1982, the primary function of which is to lift wastewater, incoming from throughout the facility, into the clarifier. As reported by Monsanto, the unit is 23 feet in diameter by 29 feet deep and is constructed of concrete with an acid brick lining (Reference 8). The unit handles, on a daily average, 1500 gallons per minute (gpm) of wastewater generated throughout the facility. The pit is covered with concrete and piping from the pump pit is above ground. It was noted during the VSI that the surface surrounding the pump pit was asphalt paved on the north side, but gravel lined on the south side.

6.1.2 Waste Characteristics

A precise determination concerning characteristics of the wastes handled by this unit is difficult to make due to the highly variable nature of what may be processed in the clarifier. Since process wastewater from a large number of production areas, as well as all surface drainage from the plant, are directed to the unit, a wide range of hazardous compounds may be managed by this SWMU. Since 40 CFR Part 261 Appendix VIII hazardous constituents are known to be in wastes produced throughout the facility, the likelihood that wastewater handled in this unit also contains such constituents is considered to be high.

6.1.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

Liquid releases from this unit would be redirected to the plant's self-contained sewer system. Therefore, the potential for a direct release to the surface water from this unit is judged to be minimal.

Soil

As stated earlier, the surface area immediately to the south of the pump pit appears to be gravel-covered soil. This introduces the possibility for any significant spills from this unit, which could occur if the sewer system backed up, to contaminate the soil to the south of the pit. During the VSI, however, there was no visible evidence of any such spillage/overflow from this unit. Furthermore, there is no information suggesting that spills/overflow have occurred in the past. Therefore, Jacobs concludes that although the potential for soil contamination exists, the probability of past releases to soil due to spills/overflow from this unit is judged to be low to moderate. In addition, the structural base of this unit (concrete with acid brick lining) would aid in precluding a release to soil from the pit.

Groundwater

As the potential for a direct release to soils from this unit has been judged to be relatively low, likewise, the potential for release to groundwater from the unit is considered to be low. Note, however, that although the potential is judged to be low, it does exist, particularly if a release from this unit was able to percolate into the soil in the unpaved area to the south of this unit.

In addition, groundwater elevations in the vicinity of this unit range from 10 to 20 feet below ground surface, thus, the water table may be higher than the bottom of the pump pit. Therefore, if the structural base of the pit was to deteriorate to the point that liquids could release, the potential for ground water contamination would be very high.

Soil Gas

The potential for subsurface gas migration/release from this unit is judged to be low. Again, however, the potential would exist if soil contamination were to occur.

Air

In the event of a surface spill from this unit, a release of any volatile constituents in the spilled material could occur.

6.2 Unit 2: Phenol Residue Storage Tank

6.2.1 Description

Prior to removal in 1986, this tank was utilized solely for the storage of a phenolic residue produced in the Phosphate Ester manufacturing department. The former location of this tank is shown on Figure 9 and can be seen in Photograph 3. The tank was located outside and above ground. When asked during the November 15, 1988 telephone call, Mr. Boland did not know the age of this tank.

As reported by Monsanto in their original Part B application, the tank's physical characteristics were as follows:

Capacity: 15,000 gallons
Height: 18'
Diameter: 8'
Thickness: 1/4"
Material of Construction: Carbon Steel
Design Pressure: 40 psi
Operating Temperature: 50-60^{o}C
Operating Level: 0-30% (<4500 gallons)

Due to space limitations, a diking system was not installed around the concrete pad on which the tank was located. However, Monsanto states that any spills or leaks from the tank would have been treated through the plant spill control system.

As stated earlier, this unit underwent closure in 1986 because of discontinuation of the related product line and, thus, the production of the phenol residue (Reference 7). Closure was accomplished under a plan approved by EPA and MDNR and was certified on October 22, 1986 as being closed by Dennis Folkemer, a Professional Engineer registered in the State of Missouri. No sampling of any type was required under the approved closure plan. Instead, Monsanto was required to clean the storage tank with a water wash and visually inspect the tank to ensure decontamination. As part of the approved Closure Plan, Monsanto intended to retain the tank at its former location for other uses. During the VSI, however, it was noted that the tank and the concrete pad had been removed. The demolished tank rubble was sent to Rollins Environmental Services, Inc. in Baton Rouge, Louisiana. Manifests for the transportation of this material are included in the revised Part B application.

6.2.2 Waste Characteristics

In their original RCRA Part B application, Monsanto specified the composition of the phenol residue to be as follows:

Partial Acid Phosphate Ester: 60%
Alkyl Phenol: 10%
Phenol: 30%

The potential for 40 CFR Part 261 Appendix VIII constituents to be associated with the phenols is considered significant, although a more detailed breakdown of the chemical constituents than that listed above is presently unavailable.

6.2.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

Due to the closure of this unit, the potential for releases to surface water are minimal to nonexistent. Despite the fact that there was no diking around this unit, the probability of past releases to surface water is considered to be minimal due to the plant's self-contained drainage system.

Soils

The concrete pad on which the tank rested had no diking associated with it, and the soils surrounding the pad were not known to have been paved, thus allowing for the potential of soil contamination. However, due to the presence of the concrete pad upon which this unit rested, and the fact that there are no known releases from this unit, the probability of past releases to soils is judged to be low to moderate.

Groundwater

Although there is a potential that soil contamination due to the lack of diking around the unit or paving of the soils, no releases are known to have occurred from this tank. Therefore, there is a low to moderate potential for percolation to the water table of any such contamination.

Soil Gas

A low to moderate potential exists for the generation of subsurface gas due to degradation of any organic constituents associated with potential soil contamination from this unit.

Air

Due to the closure of this unit, the potential for air releases is minimal; however, the possibility of air entrainment of potentially contaminated soil particles does exist.

6.3 Unit 3: Clarifier

6.3.1 Description

The clarifier (see Photographs 12 and 13 and Figure 9 for location) is part of the facility's self-contained drainage and wastewater treatment system. This unit receives waste from the pump pit and is used for the primary clarification of liquid process wastewater from the various process areas and of surface drainage from the plant's self-contained sewer system. The unit has been in operation since 1982. It is constructed of concrete with an acid brick lining, sets above ground and is open on top. The clarifier's dimensions are 90 feet by 30 feet by 20 feet deep, which would allow the unit to contain the plant's total wastewater effluent for one and one-half hours. The unit handles, on a daily average, about 1500 gpm with a normal 40 minute retention time.

As reported in Monsanto's original Part B Permit application, the clarifier is equipped with a skimming system that is designed to remove floating chemicals ("light oils"). It was reported to consist of two floating hoses equipped with a suction tray that can be moved across the water surface. Pumps were in service to remove these chemicals and place them in storage tanks. The clarifier was also reported to be equipped with a "heavy oil" removal system which removes those chemicals that settled to the clarifier bottom. This system was said to consist of a series of pipeways equipped with pumps to pull out the accumulated oily sludges.

The chemicals removed from the clarifier were to be placed in one of four clarifier storage sludge tanks prior to shipment offsite. However, as discussed in Section 6.10 (clarifier sludge storage tanks), during the VSI it was learned that the clarifier sludge storage tanks were never put into operation. During the November 15, 1988 telephone conversation, Mr. Boland stated that the clarifier is emptied approximately every 24 months and the sludges in the bottom are removed and manifested offsite as a hazardous waste. All other materials are reported to pass through the clarifier to the neutralization basin, including the floating chemicals.

After treatment in the clarifier, the wastewater is transported to the neutralization basin through piping which rests in a concrete trench running from the clarifier to the neutralization basin.

6.3.2 Waste Characteristics

A precise determination concerning characteristics of the wastes is difficult to make due to the highly variable nature of what may be processed in the clarifier. Since process wastewater from a large number of production areas as well as all surface drainage from the plant are directed to the unit, a variety of 40 CFR Part 261 Appendix VIII hazardous compounds may be managed by this SWMU.

In addition, sludges generated by the clarifier have been reported to cause corrosivity problems in piping leading from the unit (Reference 3). This information indicates that these wastes may exhibit the hazardous waste characteristic of corrosivity.

6.3.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

The clarifier is designed so that overflow over the sides of the unit will drain directly back into the wastewater treatment system which, in turn, discharges to the MSD. Therefore, the potential for a direct release to surface water of untreated wastewater is considered to be minimal.

Soil

Due to the containment provided by the acid brick-lined concrete base of the clarifier, the potential for release to the soil from this unit is judged to be minimal. However, the soil surrounding this unit is gravel lined and could be contaminated in the event of wastewater overflowing from the top of the unit, an occurrence which is considered to be unlikely.

Groundwater

Due to the containment associated with this unit, the potential for release to groundwater is considered to be minimal. However, in the event of overflow from the unit, this conclusion should be re-evaluated, as the unpaved soils surrounding this unit could allow for percolation of contaminants to the water table.

Soil Gas

The potential for subsurface gas migration/release from this unit is currently considered to be low .

Air

As stated earlier, the wastewater surface in the clarifier is open to the atmosphere. This allows for possibility of direct release to air of any volatile constituents in the wastewater.

6.4 Unit 4: Neutralization Basin

6.4.1 Description

The neutralization basin is a part of the plant's wastewater treatment system and is used to adjust the wastewater pH (using lime, anhydrous ammonia, or sulfuric acid) after primary clarification but prior to discharge to the MSD. See Figure 9 for this unit's location. The basin, which has been in operation since 1972, is of a concrete base with acid brick lining. The unit's dimensions are approximately 45 feet by 37 feet by 24 feet deep and handles a daily average of 1500 gpm of wastewater. A series of pH monitors are associated with the basin which are to aid in detecting excessive acidic or basic concentrations in the wastewater. During the November 15, 1988 telephone conversation, Mr. Boland stated that there are no sludges generated in the operation of the unit.

6.4.2 Waste Characteristics

Waste process water, chemical spills, and surface drainage water from throughout the plant are managed by this unit. Therefore, a precise representative determination of the characteristics of wastes handled cannot be made. However, it is likely that this unit will, over time, handle a wide range of 40 CFR Part 261 Appendix VIII hazardous compounds.

6.4.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

Due to the plant's self-contained drainage and wastewater treatment system, any potential spills from this unit would be redirected through the wastewater treatment system. Therefore, the potential for a direct release to surface water (prior to entering the MSD) is currently judged to be minimal.

Soil

Due to acid brick-lined concrete base of this unit and the plant's self-contained drainage system, the potential for a release to soil from this unit is currently judged to be minimal.

Groundwater

Due to the containment associated with this unit, the potential for a release to groundwater is currently considered to be minimal.

Soil Gas

The potential for soil gas migration/release from this unit is currently judged to be low.

Air

It is expected that any volatile constituents in the wastewater would have already released to air at this point in the wastewater treatment system. Therefore, the potential for release to air from this unit is currently judged to be minimal.

6.5 Unit 5: Boiler Slag Accumulation Pad

6.5.1 Description

This unit, as observed during the VSI, is an accumulation area for furnace slag from a coal fired boiler (Photograph 11). See Figure 9 for the location of this pad. The dimensions of the pad are 20 feet by 20 feet and it rests on a paved area. Monsanto reports that the pad has been in operation since 1948 (Reference 8), although it is unclear if the pad has always existed at its present location or if the area has always been paved. It is noted that the slag which is handled in this area is exempted from consideration as a hazardous waste by 40 CFR Part 261.4(b) 4.

6.5.2 Waste Characteristics

Chemical and physical analyses of the slag material are not available to Jacobs and it is unclear if any such analyses exist. However, several hazardous compounds are known to often be associated with coal slag including polynuclear aromatic hydrocarbons and heavy metals.

6.5.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

Storm water/surface water drainage from this area is directed to the plant's wastewater treatment system; therefore, the potential for a release to surface water from this unit is currently considered to be low.

Soil

Due to the pavement upon which the pad rests, the potential for further or continued releases to soil is considered to be minimal. However, it is unclear if the slag accumulation area has been paved during its entire history of operations. If there was a period when slag was placed on unpaved soil, then contamination of soil may have occurred.

Groundwater

Due to pavement upon which the pad rests, the potential for further releases to groundwater is considered to be minimal. It is noted, however, that if the pad ever existed on unpaved soil, release to groundwater may have occurred.

Air

The potential exists for a release to air of any air-entrained contaminated dust particles from the slag pile. The potential would be increased during times when the slag pile is disturbed, such as when the slag is deposited on the pad or removed for offsite disposal.

6.6 Unit 6: CAC Spill Pond

6.6.1 Description

The CAC spill pond is a 90 feet by 30 feet by 10 feet deep spill collection basin which has been in operation since 1972 (see Photograph 16 and Figure 9 for location). The unit is designed to capture spills from the CAC residue storage tank, as well as several other tanks located near the CAC tank. The spill pond is made of concrete with a corrosion masque liner. Wastes enter the south end of the pond by underground piping at a daily average of 300 gpm (Reference 8). Water is continuously maintained in the spill pond by a baffle system. Process wastewater from the CAC production area passes through this baffle system. The water is maintained in the pond by the baffle system in order to create a water interface for any potential chemical reactions or for any catastrophic spillage from the CAC production area and/or the CAC waste storage tank. A six foot high chain link fence surrounds the pond and the area immediately surrounding the unit is gravel covered.

6.6.2 Waste Description

This unit has been designed primarily to contain spills from the CAC residue storage tank area. Therefore, characteristics of wastes handled by this unit would be similar to those described in Section 5.3 for the CAC residue.

6.6.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

Due to the volume of containment available in the pond to hold excessive spills of wastewater and the plant's self-contained drainage system, the potential for a direct release to surface water from this unit is currently considered to be minimal.

Soils

Due to the concrete lining of this unit, the integrity of which is believed to be good, the potential for a release to soil through cracks in the unit's lining is currently considered to be minimal. The threat of overflow from the pond is low and, therefore, the potential for release to soils beneath the gravel lining surrounding the unit is also judged to be minimal.

Groundwater

As the potential for a release of liquid waste from concrete lined unit is considered to be minimal, likewise, the potential for release to groundwater from this unit is currently judged to be minimal.

Soil Gas

As the potential for contamination of soil due to releases from this unit has been judged to be minimal, therefore, the potential for subsurface gas generation is also judged to be low.

Air

The potential exists for a release of volatile constituents of the wastes handled by this unit.

6.7 Unit 7: Self-Contained Sewer System

6.7.1 Description

As reported during the VSI, in 1981 the facility completed an extensive rehabilitation of the plant's existing sewer system. The new system is self-contained in that all surface drainage at the facility is directed through this system to the plant's wastewater treatment system (clarifier and neutralization basin). The sewer system also handles process wastewater generated in production areas throughout the plant, as well as spills from various process and waste handling areas. The system consists of drains, manholes, gatewells, and various sized clay piping. Despite the rehabilitation of the sewer system, it is Jacobs' understanding that portions of the system predate the 1981 revamp.

According to the November 15, 1988 telephone conversation, Mr. Boland stated that the Maintenance Department conducts routine inspections of the sewer system. These inspections include visual observation of accessible portions such as manholes and drains and video inspection of underground piping, where this is possible. If deterioration is detected, the sewer is repaired as appropriate. Repair methods include retrofitting and replacement. Mr. Boland did not know the frequency of these inspections.

6.7.2 Waste Characteristics

The characteristics of wastes handled by the sewer system are highly variable, as process wastewater and spills from throughout the plant are handled by the system, as is surface water drainage from the entire facility. Based on knowledge of a number of the manufacturing processes at the plant, it is believed that the sewer system handles a number of 40 CFR Part 261 Appendix VIII hazardous constituents.

6.7.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

Due to the nature of the system, including the fact that it is primarily underground, the potential for a direct release to surface water is considered to be minimal.

Soils

Contamination of soil due to releases from this unit could occur in one of two ways. During extremely excessive rainfall events, or if the system was physically blocked, the pipes could back up and outflow could occur from manholes and drains, with the possibility of contamination of any surrounding unpaved soils. However, the potential for this occurring is considered to be relatively low.

And secondly, releases to soil could occur due to degradation of any portion of the system, but especially the piping. Due to the "newness" of at least a portion of this rehabilitated system, the potential for releases to soil from the new portions of the system is considered to be moderate to low. However, as the system becomes older and more susceptible to degradation, this potential could increase dramatically. In older portions of the system's piping, the potential for releases to the soil are considered to be moderate to high. This conclusion is based on the assumption that the piping will likely have undergone natural deterioration, possibly accelerated by corrosive wastewater handled by the sewer system, to the point where leaks from the piping are possible. Likewise, the probability of past releases from piping which was replaced in 1981 is considered to be moderate to high, also due to likely deterioration of the clay piping in the network.

Groundwater

Because the potential for direct release of liquids from the new portions of the system is, at this time, considered to be relatively low, the potential for a continued direct release to groundwater is also considered to be relatively low. However, as with soils, this potential could increase significantly if breaches in the structural integrity of the system occur, allowing releases which could eventually percolate to the water table. The potential for releases from the portions of the system which predate the 1981 rehabilitation and the probability of past releases from the piping which has been replaced is considered to be moderate to high. This is based on the assumption that natural deterioration of the piping occurred, possibly to the point to allow for releases.

Soil Gas

Because it is likely that wastewater contains degradable organics and as the probability/potential for past and current releases to the soil has been judged to be moderate to high, likewise, the potential for subsurface soil gas generation/migration from this unit is considered to be moderate to high.

Air

Since wastes handled by this system are transported by piping closed to the atmosphere, the potential for releases to air from the system is considered to be relatively low. However, the potential does exist for the release of any volatile constituents of the wastes at drain and manhole locations.

6.8 Unit 8: Laboratory Coalescer

6.8.1 Description

The laboratory coalescer is a fiberglass-lined concrete tank which is described by Monsanto as a "primary wastewater separation unit" (Reference 8). The tank's dimensions are 20 feet by 20 feet by 10 feet deep, it sits below ground, and has been in operation since 1981. The unit collects, via underground piping, liquid wastewater generated in the facility's laboratory and handles waste at an average daily rate of 10 gpm. The coalescer is located in an asphalt lot and drainage from this lot is directed through the plant's drainage and wastewater treatment system. The tank is basically a sump with a baffle (overflow weir). Material is pumped into the tank with sludge-like material settling out. The liquid which discharges over the overflow weir is released directly to the city sewer system. The coalescer is periodically emptied with the sludge being removed and disposed of offsite. It was reported to Jacobs during the VSI that this unit is the only area in the plant that discharges untreated chemical wastes directly to the city sewer system.

6.8.2 Waste Characteristics

Chemical analysis of the laboratory wastewater handled by the coalescer are currently not available to Jacobs. Therefore, at this time Jacobs is not able to present a detailed discussion of the waste characteristics. However, because much of the work performed in the laboratory relates to ongoing processes at the plant which produce hazardous compounds, the potential for the wastewater in this unit to also contain hazardous compounds is considered to be high.

6.8.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

Due to the integrity of the fiberglass-lined concrete tank and the containment provided by the facility's self-contained drainage system, the potential for a direct release to surface water is currently considered to be low.

Soils

For the reasons presented in the surface water discussion, the potential for a release to soils from this unit is currently considered to be low.

Groundwater

As the potential for leakage and/or spillage of wastes from this unit has been judged to be low, likewise, the potential for a release to groundwater from this unit has been judged to be low.

Soil Gas

The potential for subsurface soil gas migration/release from this unit is considered to be low.

Air

The potential exists for a release of any volatile constituents in the wastes handled by this unit, due to the fact that the unit is open to the atmosphere.

6.9 Unit 9: Former Quarry Location

6.9.1 Description

This unit was a limestone quarry located in the southeast portion of the facility (see Figure 9). There is no available information on the operators of the quarry or its period of operation. Monsanto reported that it purchased the property on which the quarry was located from American Car Foundry (ACF) in 1953 (Reference 8). Monsanto leased the property back to ACF until 1961. ACF used the former quarry for the disposal of foundry slag. Fox Brothers Industrial Corporation (Fox) reclaimed metal from the quarry from 1963-1969. Monsanto provided Fox with clean backfill specifications but refuse-type materials were identified in the former quarry during previous foundation investigations and monitoring well installation in this area. The dimensions of the former quarry area are approximately 200 feet by 600 feet.

6.9.2 Waste Characteristics

Chemical analyses of the fill material used in the quarry apparently have not been performed, thus precluding a precise determination of the wastes characteristics. It has been reported that foundry slag was the primary fill material with some refuse-type materials also disposed of here. Due to the fact that metals reclaiming has taken place in the former quarry area and because heavy metals have been detected in groundwater samples obtained in this area (to be discussed in the next section), heavy metals are suspected to be present in the wastes at elevated levels. In addition, the potential for other hazardous constituents to be present in the soil is considered to be moderate to high.

6.9.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

Because the majority of the wastes are buried and also because surface runoff from this area is directed through the plant's wastewater treatment system, the potential for a direct release to surface water is considered to be minimal. The potential does exist, however, for the discharge of contaminated groundwater to the Mississippi River.

Soils

Due to the nature of the fill material (foundry slag and other refuse) it is suspected that soil concentrations of heavy metals are elevated, although, at this time there are no analytical results to confirm this assertion. It was not noted during the VSI if the entire area had concrete or asphalt paving; however, if portions of this area are not paved, the potential would exist for direct exposure to contaminated surface soil.

Groundwater

As part of Monsanto's previous hydrogeologic investigations at the site, several wells, including a groundwater monitoring well nest (MW-11; see Figure 3) were installed in the former quarry area. Chemical analyses performed on groundwater samples collected from MW-11 wells have indicated heavy metal contamination. Metals detected included chromium as high as 24,200 ug/l, antimony as high as 11,200 ug/l, lead as high as 394 ug/l, and zinc up to 784 ug/l (Reference 1). Due to the location of the wells and the foundry slag fill, the former quarry is the suspected source of the heavy metals contamination. If the fill material in this area is contaminated with metals, the potential for continued releases to groundwater is considered to be high.

Soil Gas

The potential for subsurface soil gas generation/migration is considered to be relatively low to moderate. Examination of groundwater sampling analytical results as discussed above and knowledge of the type of fill material suspected to be in this unit indicate that the primary contaminants of concern are metals which would not generate subsurface gas. However, because the exact nature of the fill material is unknown, degradable organics could be present.

Air

The potential for a release to air from this unit is considered to be minimal.

6.10 Unit 10: Clarifier Sludge Storage Tanks (4)

6.10.1 Description

As reported in Monsanto's revised Part B application, these tanks were dismantled in 1987 after being removed from the plant's interim status classification by MDNR. The clarifier sludge storage tanks were located outside and were aboveground (see Figure 9 for location). These tanks, as discussed in Monsanto's RCRA Part B Permit application, were originally intended to store wastewater sludges removed from the facility's clarifier. During the VSI, however, it was reported to Jacobs by Monsanto that the tanks were never put into operation for the storage of clarifier sludge. Instead the tanks were apparently used for the storage of used fuel oil. The Hazardous Waste Compliance Inspection Report (Reference 3) for the April 24, 1986 inspection of the Monsanto facility by MDNR states that four waste clarifier sludge storage tanks were empty and were expected to remain empty until the company found a solution to a corrosion problem in the feed lines to these tanks. This corrosion was stated in the report to have been due to the acidic sludge generated from the clarifiers. This information would indicate that, possibly, these tanks were used for the storage of the waste clarifier sludge at one time. No other information on the past use of these tanks is available.

Monsanto, in their original RCRA Part B application, described the tanks' physical characteristics as follows:

Capacity: 10,000 gallons (each)
Height: 18'
Diameter: 10'
Thickness: 1/4"
Material of Construction: Stainless Steel
Design Pressure Rating: 40 psi
Operating Temperature: 25 - 30°C
Operating Level: Varies (0-30%)

The tanks were equipped with a high level alarm that was to sound at the 90% level (-9,000 gallons). All controls for the tank were in the department control room; however remote switches were also located in the field. The tanks were located within a curbed concrete area which drains back to the clarifier, therefore, any spills from the tanks would have been contained within the wastewater treatment system.

Further, it is Jacobs' understanding that the tanks were in a paved area during the entire life of the tanks.

6.10.2 Waste Characteristics

As stated earlier, the tanks were apparently used to store used oil which is generated throughout the plant. The waste is primarily oil, but may also contain small percentages (1-5%) of ammonia and freon (trichlorofluoromethane). It is unknown if the used oil exhibited any characteristics of a hazardous waste.

6.10.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

Due to the spill containment that was associated with these tanks, as discussed above, the probability of a past direct release to surface water is currently considered to be minimal.

Soil

Due to the concrete paved area in which these tanks were located and the associated spill containment system, the probability of past releases to soil from these tanks is currently considered to be minimal.

Groundwater

Due to the spill containment that was associated with the tanks, the probability of past releases to groundwater is currently judged to be minimal.

Soil Gas

The potential for subsurface gas migration release due to these tanks is currently considered to be low.

Air

Review of engineering drawings (Reference 2) for the tanks indicated that they could be vented, allowing for the possibility for releases to air of any volatile constituents in the waste oil. The potential for current releases to air are believed to be nonexistant.

7.0 RELEASE INFORMATION FOR AREAS OF CONCERN

Information regarding the areas of concern at the Monsanto-Queeny Plant was obtained from several sources including:

- RCRA Part B Permit Application, Monsanto-Queeny Plant, November 7, 1984 (Reference 2).
- Historical aerial photographic analysis, 1956-1958 (Appendix C).

- o Trial Burn Plan, Monsanto-Queeny Plant CAC Incinerator; by James A. Peters - Terran Corporation, May 1988 (Reference 6).

- o Observations by the EPA and Jacobs representatives during the VSI, March 1, 1988. Field Log book attached as Appendix D.

- o Telephone conversations between representatives of Jacobs Engineering and Monsanto (Appendix E).

- o Correspondence between EPA and Monsanto concerning the subject units.

7.1 Area 1: Railroad Unloading Area

7.1.1 Description

As observed during the VSI, the railroad unloading area is that portion of the facility where raw chemicals arriving by railcar are pumped from tanker cars to their respective raw material product tanks (see Photograph 22, Figure 10 for location). The area for unloading is bermed, with any overfill or drainage being directed to an underground stainless-steel tank. Wastes from this tank are moved into the process area, via above ground piping, for reclamation.

Most of the unloading area is paved; however, a limited area approximately 10 to 15 feet wide immediately surrounding the railroad tracks is characterized as gravel covered soil (Photograph 22). During the November 15, 1988 telephone conversation, Mr. Boland stated that, although he was unsure of the exact dates of operation, the railroad unloading area was in operation a number of years before the installation of the currently existing containment system.

7.1.2 Waste Characteristics

Raw materials for a large number of production processes arrive at the plant through this area. Therefore, spills and/or releases in this area could display the characteristics of a wide variety of chemical compounds, with the possible inclusion of a number of 40 CFR Part 261 Appendix VIII hazardous constituents.

7.1.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

Due to the berming around this area which directs all drainage to an underground storage tank, the potential for a direct release to surface water from this area is considered to be low. If groundwater is, or becomes, contaminated due to activities in this area, the potential would exist for discharge of contaminated groundwater to the Mississippi River.

Soils

In that portion of the unloading area which is paved, the potential for a direct release to the soil is currently considered to be minimal. However, in that portion of the unloading area which is gravel covered soil, the potential for release to the soil is considered to be moderate to high. Since the unloading area is known to have been active before the containment system was installed, the probability of past releases to the soil is considered to be moderate to high. This conclusion is based on the likelihood of periodic spillage while raw chemical materials are being pumped from the tanker cars.

Groundwater

As it has been judged that the potential exists for both present and past releases to unpaved soil in the area, correspondingly, there is a moderate to high potential for this contamination to leach to the water table. Two groundwater monitoring wells have been installed in the immediate vicinity of the railroad unloading area (GM-1 and GM-2). Another monitoring well is located approximately 200 feet from the railroad unloading area in what appears to be the downgradient flow direction of the groundwater (MW-12). A fourth groundwater monitoring well was installed approximately 75 feet from the unloading area in the upgradient flow direction (MW-14). Additional wells are located further upgradient from the railroad unloading area. Monitoring wells GM-1 and GM-2 were installed as part of the hydrogeologic investigation of the Lasso Production Area. The only analytical results presented by Geraghty & Miller were for six compounds that are associated with the production of Lasso. These results showed alachlor, acetyl alachlor and chlorobenzene contamination of the groundwater in concentrations ranging from 10 to 169 milligrams per liter (mg/l) (Table 3). Due to the proximity of the Lasso Production Area to these monitoring wells, it is difficult to determine how much, if any, of this contamination emanated from the railroad unloading area. The fact that an upgradient monitoring well, MW-14, has shown significant concentrations of these compounds, it appears likely that these contaminants have originated from the Lasso Production Area.

Geraghty & Miller presented analytical results for periodic sampling events of MW-12 from January 1985 to December 1986. These results indicate the presence of dichlorodifluoromethane and methylene chloride ranging in concentration from not detected to 29 micrograms per liter (ug/l). Polynuclear aromatic hydrocarbons such as acenaphthene, fluoranthene, and fluorene were detected in concentrations ranging from not detected to 13 ug/l (Reference 1). Due to the location of the groundwater monitoring wells, coupled with cyclical or seasonal fluctuations in groundwater flow direction as reported by Geraghty & Miller, Inc., it is impossible to accurately determine the contribution of the railroad unloading area to groundwater contamination in the area.

Soil Gas

There is a moderate potential for soil gas generation due to degradation of organics which may have contaminated soils in this area.

Air

The potential exists for the release to air of volatile constituents contained in any materials which may be spilled during unloading from the tanker cars. There is also a low to moderate potential for air entrainment of contaminated soil particles from this area.

7.2 Area 2: Underground Storage Tanks

7.2.1 Description

In a letter from Robert Boland of the Monsanto-Queeny Plant, to Lyndell Harrington of the EPA Region VII RCRA Branch, Monsanto identified 32 underground tanks which were described as "leakers" (Reference 8). The tanks were identified as "leakers" by the fact that groundwater had seeped into the tanks. All but two of these tanks have since been removed. Because of the similarity of information available on these tanks, discussion of these units will be combined and presented in this section. Figure 11 shows the former locations of the tanks and Table 2 presents available information, as supplied by Monsanto, on the tanks, including size in gallons, last chemical stored, date installed, and date abandoned. The information contained in this table is the only information which Monsanto claims is available. Upon abandonment, the tanks were typically filled with sand. All of these tanks were removed with the exception of T-29 and T-30, which were left in place due to obstructions making removal impractical. With the exception of T-31, it does not appear from information available to Jacobs that any post-removal sampling was performed at these locations to confirm or deny the presence of contamination in surrounding soil.

7.2.2 Waste Characteristics

Table 2 presents all information available to Jacobs concerning chemicals stored in these tanks. As can be seen, for a majority of the tanks, it is unknown what chemicals were stored in them. Chemicals known to be stored in the tanks include ethanol, methanol, butanol, methyl ethyl alcohol, perchloroethylene and gasoline.

7.2.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

Because the tanks were located underground, the probability of past or present direct releases to surface water is considered to be minimal. However, if groundwater has been contaminated due to releases from these units, the possibility exists for discharge of contaminated groundwater to the Mississippi River.

Soil

The probability that releases to soil from a number of these tanks have occurred is judged to be high. As reported in Reference 1, samples of soil surrounding T-31, collected during a previous investigation, revealed perchloroethylene contamination in the soil immediately adjacent to the tank (which is known to have stored perchloroethylene) with concentrations decreasing with increasing distance from the tank. These results illustrate the probability that the "leakers" have contaminated the surrounding soil.

Groundwater

The probability that releases to groundwater from a number, if not all, of the tanks have occurred is considered to be high. Again, as reported in Reference 1, groundwater samples collected from wells in the vicinity of T-31 have demonstrated high perchloroethylene concentrations (as high as 225,832 ug/l), and in one instance free-phase perchloroethylene was detected. According to the Safe Drinking Water

Hotline in Washington, D.C., a Maximum Contaminant Level (MCL) for perchloroethylene is expected to be proposed in early 1989. This MCL is expected to be 0.005 mg/l (Appendix E). Both soil and groundwater sampling results indicate that releases from T-31 are the source of this contamination. These results again illustrate the probability that the "leakers" contaminated the surrounding media, including groundwater. Contributing to the high potential for groundwater contamination is the fact that the water table intercepted or was above the depth at which the tanks were located, as can be seen by the fact that water, thought to be groundwater, was found in the tanks.

Soil Gas

The potential for subsurface gas migration/releases from the tanks is judged to be moderate to high. This potential varies from tank to tank and would depend on the extent of liquid release from an individual tank and the chemical constituents of such a release.

Air

Because the tanks were located underground, the potential for a release to air due to any past releases from the unit is judged to have been minimal.

7.3 Area 3: Fire Training Area

7.3.1 Description

The fire training area is an area located in the southeast portion of the facility (see Photograph 21 and Figure 10 for location) where fire fighting techniques are practiced. As observed during the VSI, the area consists of a concrete lined pit surrounded by gravel covered soil. There is no freeboard or berming associated with the pit. The area is enclosed by a chain-link fence.

A centrally located drainage grate collects surface runoff/spillage and directs it through the plant's wastewater treatment system. It was reported to Jacobs during the VSI that kerosene is poured on water contained in the pit and ignited. The fire is then extinguished using established fire fighting techniques.

During the November 15, 1988 telephone conversation, Mr. Boland stated that the fire training area has been in operation at its present location since the mid-1970's. To the best of his recollection, the concrete-lined pit has been in place since the beginning of operations at this location. Mr. Boland was unaware of any other areas which may have served as a fire training area before the mid-1970's.

7.3.2 Waste Description

As reported to Jacobs during the VSI, kerosene is used in this area during fire fighting training exercises. It is unknown if any other flammable compounds are used. A typical analysis of kerosene includes n-dodecane, three alkyl derivatives of benzene, naphthalene, and 1- and 2-methyl -5, 6, 7, 8 - tetrahydronaphthalene (Reference 11). Benzene and naphthalene are 40 CFR Part 261 Appendix VIII hazardous constituents.

7.3.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

Spills and stormwater drainage from this area are collected by the facility's self-contained sewer system and directed through the wastewater treatment system. Therefore, the potential for a direct release to surface water from this unit is considered to be low. If groundwater was contaminated by this area, however, the potential would exist for the discharge of contaminated groundwater to the Mississippi River.

Soils

The concrete lining of the pit is believed to be adequate enough to prevent leakage of wastes through the bottom and sides of the pit. However, it is believed that there is a moderate to high potential for contamination of the gravel lined soils surrounding the concrete burn pit. This conclusion is based on the potential for spillage of kerosene or other flammables as they are being placed in the pit. It is also believed that the potential exists for any high pressure spray used to extinguish the fire to spread unignited flammable material on the soils surrounding the pit.

Groundwater

As it has been judged that the potential exists for a release of contaminants to surrounding soil, correspondingly, there is a moderate to high potential for this contamination to leach to the water table.

Soil Gas

There is a moderate potential for soil gas generation due to degradation of organics which may contaminate the soils.

Air

The potential exists for the release to air of volatile constituents contained in materials burned in the pit, as does the potential for releases during the time when the kerosene is burned. In addition, the potential exists for air entrainment of the potentially contaminated soil particles surrounding the burn pit.

7.4 Area 4: Lasso Production Area

7.4.1 Description

The Lasso production area is that portion of the plant in which Monsanto produces its Lasso brand herbicide (see Figure 10). This area has been included for discussion because previous investigations conducted in the vicinity of the process area have indicated that soil and groundwater contamination is present which is believed to be associated with the production of Lasso. As a part of the investigation performed by Geraghty and Miller, Inc. on behalf of Monsanto in November 1986, ten soil borings and monitoring wells GM 1 through 5 (Figure 3) were completed in the vicinity of the Lasso production area (Reference 1).

7.4.2 Waste Characteristics

Chemical compounds associated with Lasso production include alachlor, chlorobenzene, diethylaniline and acetyl alachlor. Chlorobenzene is a 40 CFR Part 261 Appendix VIII hazardous constituent.

7.4.3 Migration Pathways, Evidence of Release, Exposure Potential

Surface Water

Due to the plant's self-contained drainage and wastewater treatment system, the potential for a direct release to surface water is considered to be minimal. Any groundwater contaminated by releases from this area, however, has the potential to discharge into the Mississippi River.

Soils

As described in the Geraghty and Miller report, ten soil borings were advanced in this area, five of which were completed as monitoring wells. The samples were not chemically analyzed; however, soils in two of the borings were stained to a depth of four feet below ground surface. In addition to this information, data will be presented in the next section indicating contamination of groundwater with compounds associated with Lasso production. In light of the above discussion, Jacobs considers it likely that a release to soil has already occurred.

Groundwater

Groundwater samples collected from the monitoring wells in the immediate vicinity of the Lasso production area have shown significant concentrations of each of the earlier identified constituents associated with Lasso production. Table 3 presents the referenced analytical results. Based on these analytical results, Jacobs concludes that releases to groundwater from the Lasso production area have occurred.

Soil Gas

The potential exists for the generation of subsurface soil gas due to the degradation of organic material in soil contamination.

Air

The probability exists that air releases have occurred from this area. Monsanto currently holds 470 permits with the City of St. Louis, including permitted releases from the chemical production areas.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 RCRA Regulated Units

8.1.1 Azomethine Residue Storage Tank

The Azomethine Residue Storage Tank is utilized for the storage of azomethine residue produced in the alachlor manufacturing department. Due to the spill containment associated with this unit, the potential for a release of hazardous materials to the environment is currently considered to be low. Based on Jacob's review of Monsanto's inspection schedule and procedures, and other available information pertaining to the tank, Jacobs is recommending that no further actions be taken at this time.

8.1.2 Azomethine Residue Holding Tank

The Azomethine Residue Holding Tank is used to temporarily store azomethine residue immediately prior to injection into the CAC incinerator. Due to the spill containment associated with this unit, the potential for a release of hazardous materials to the environment is currently considered to be low. Based on Jacobs' review of Monsanto's current tank inspection schedule and procedures, and other available information pertaining to the tank, Jacobs is recommending that no further actions be taken at this time.

8.1.3 Chloroacetyl Chloride (CAC) Liquid Waste Storage Tank

The CAC Liquid Waste Storage Tank is used solely for storage of a liquid waste produced in the CAC manufacturing department. Due to the spill containment associated with this unit, the potential for a release of hazardous materials to the environment is currently considered to be low. Based on the review of available information pertaining to the tank, including inspection schedule and procedures, Jacobs is recommending that no further actions be taken at this time.

8.1.4 CAC Incinerator

The CAC incinerator burns waste from the CAC and the alachlor manufacturing processes. Due to the pavement upon which the incinerator rests and the spill containment system associated with this unit, the potential for a release of a hazardous waste to the environment is currently judged to be minimal. An exception to this statement is the release to air of incinerator combustion gases, which is likely to include carbon monoxide. When analyses of the incinerator emissions are made available, further review of this migration pathway should be made. It is noted that, according to 40 CFR 264.343, any incinerator burning hazardous wastes must be designed to operate so as to achieve a destruction and removal efficiency (DRE) of 99.99% for each Principal Organic Hazardous Constituent (POHC) designated in its permit. One or more POHCs will be designated by EPA in the facility's incinerator permit.

8.1.5 Container Storage Lots

Monsanto has used three different container storage lots. The first lot was described in the original Part B application, but was removed in 1987. This lot was located west of the former location of the ZZ building and was used to store drummed hazardous wastes on wooden pallets. The lot had a concrete base with asphalt lining. The second lot was a temporary storage area which was being used in place of the closed lot while a permanent lot was being constructed. This lot was also paved, and was also used for hazardous waste drum storage. A permanent container storage lot now exists at the facility. This lot is completely paved with all spills and runoff in the area directed to the plant's self-contained sewer system.

Based on the recent containment associated with these lots, as described above, the potential for release of hazardous materials to the environment is considered to be low. However, because verification of the former lot's containment history has not been provided, Jacobs recommends the following:

- o Monsanto should provide information describing containment associated with the lots since the beginning of use of the respective areas as container storage lots.
- o The 1956 aerial photograph indicates that drum storage may have been located in other areas of the Monsanto property; however, for the purposes of further evaluating historical waste management at the site, Monsanto should also provide information concerning past storage areas used for hazardous waste drum storage.

At this time, Jacobs is recommending that sampling not be conducted at these units. However, if new information comes to light indicating that either lot has operated without adequate containment, or if any additional areas are identified which may have contributed contamination to the environment, re-evaluation of this recommendation would be required.

8.1.6 Container Storage Building

The container storage building is used to store wastes derived from a cleanup of buildings contaminated with trace amounts of dioxin.

Due to the containment associated with this unit, the potential for a release of hazardous constituents to the environment is considered to be extremely minimal. Based on that conclusion, Jacobs is recommending that no further action, in terms of sampling, be taken at this unit.

8.2 Solid Waste Management Units

8.2.1 Pump Pit

The pump pit is a wastewater diversion structure used to lift wastewater from throughout the facility into the clarifier. Due to the containment associated with this unit, including the pit's acid brick-lined concrete base and the plant's self-contained drainage system, the potential for direct releases of hazardous materials to the environment from this unit is considered to be relatively low. During the VSI, however, it was noted that the surface area immediately south of the pit was gravel covered soil and not otherwise paved. This introduces the potential of releases to soil, and possibly groundwater, if spills/overflow from the unit are released from the pit. Because there is no evidence of any past spillage from the unit, and because the pit is periodically inspected as part of a preventative maintenance program, Jacobs is, at this time, recommending that no sampling be conducted at this unit.

8.2.3 Clarifier

The clarifier receives waste from the pump pit and is used for the primary clarification of liquid process wastewater from the various process areas and of surface drainage from the plant's self-contained system. Due to the containment associated with this unit, the potential for releases of hazardous compounds to the environment from this unit is judged to be minimal, with the possible exception of releases to air of volatile compounds in the wastewater. This statement assumes that the integrity of the clarifier's lining has not been, and will not be, compromised. Monsanto inspected the unit in April 1988 and reported no problems. A similar inspection conducted three years earlier yielded the same results. Because of the wide range of chemicals that are managed in this unit, it is recommended that the unit be inspected at least once a year, with particular attention paid to the acid brick-lined concrete base. If the integrity of this lining has been breached, immediate corrective measures should be implemented. The above conclusion also assumes the potential of wastewater overflow from the top of this unit to be minimal.

At this time, Jacobs is recommending that no further action, in terms of sampling, be conducted at this unit.

8.2.4 Neutralization Basin

The neutralization basin is used to adjust the wastewater pH after primary clarification but prior to discharge to the MSD. Due to the containment associated with this unit, the potential for releases of hazardous compounds to the environment is considered to be minimal. This determination assumes that the integrity of the unit's acid-brick lined concrete base has not been, and will not be, compromised. During the VSI it was learned that Monsanto last inspected the basin in 1982. Monsanto should inspect this unit as soon as possible and every year thereafter to ensure the structural integrity of the acid brick-lined concrete base, as cracks in this base could result in release of contamination to the media surrounding the unit. If the integrity of the base has been compromised, corrective measures should be implemented immediately. At this time, Jacobs is recommending that no sampling be conducted at this unit.

8.2.5 Boiler Slag Accumulation Pad

The accumulation area for furnace slag from a coal fired boiler rests on a paved area and has been in operation since 1948. Due to the pavement upon which the unit rests and spill containment associated with the unit, the potential for further release of hazardous compounds to the environment is considered to be low. A possible exception to this would be a release to air of any contaminated dust particles from the slag. However, potential past releases cannot be fully evaluated until more information is obtained concerning historical location of this unit and any containment associated with it. After review of all currently available information associated with this unit, Jacobs recommends the following:

- o Additional information should be obtained from Monsanto concerning the historical operation of this unit. Of interest are any other locations where this unit may have operated and any containment that may have been associated with these locations. Of particular interest is whether this unit ever existed on unpaved soil.

- o If additional information shows that, in the past, the unit rested on unpaved soil or is unable to show conclusively that the unit never rested on unpaved soil, then sampling should be performed. At least one soil core should be collected from this area (or one from each area, if more than one area has existed) and be analyzed for a full priority pollutant scan.

8.2.6 CAC Spill Pond

The CAC Spill Pond is designed to capture spills from the CAC residue storage tank, as well as several other tanks located near the CAC tank. The spill pond is made of concrete with a corrosion masque liner. Due to the containment associated with this unit, as described above, the potential for a release of hazardous constituents to the environment from this unit is considered to be low. An exception is the potential for release to air of volatile compounds in the wastes handled by this unit. The above conclusion assumes that the integrity of the unit's structural base will not be compromised. Monsanto should periodically inspect this unit to ensure that cracking, which could allow releases, does not develop. At this time, Jacobs is recommending that no sampling be conducted at this unit.

8.2.7 Self-Contained Sewer System

The Monsanto facility's new sewer system is built so that all of the plant's surface drainage is directed to the plant's wastewater treatment system. The probability of past releases from replaced piping and the potential for releases from portions of the sewer system not rehabilitated in 1981 is judged to be moderate to high. This is based on the assumption that natural deterioration, possibly accelerated by corrosive wastewater handled by the system, would have occurred. At this time, Jacobs is recommending that no sampling be conducted in association with this unit; however, Monsanto should review past results from their leak detection program. If these records reveal any areas where leaks had occurred prior to rehabilitation or replacement, Monsanto should perform sampling of these areas as part of the RFI.

8.2.8 Laboratory Coalescer

The laboratory coalescer is a fiberglass-lined concrete tank which is used to collect liquid wastewater generated in the facility's laboratory. This unit discharges untreated chemical wastes directly to the MSD. Due to the structural integrity of this unit and the containment offered by the facility's self-contained drainage system, the potential for direct release of hazardous compounds to the environment is considered to be low. A possible exception to this is the release to air of any volatile constituents contained in the tank. To help ensure that future releases from this unit do not occur, Jacobs recommends the following:

- o Monsanto should periodically inspect the interior of this unit to ensure its structural integrity is not compromised, as such compromises will increase the potential for direct release to the environment.

At this time, Jacobs is recommending that no sampling be conducted at this unit. However, to assess the impact of discharging untreated chemicals directly to the MSD, Monsanto should provide information in the form of chemical analyses which would be representative of the wastes handled by this unit.

8.2.9 Former Quarry Location

A limestone quarry was formerly located in the southeast portion of the facility. This quarry was specified to be backfilled with clean fill, but refuse-type materials were identified during previous foundation investigations at this location. Due to the nature of the fill material (foundry slag) in the former quarry area and review of groundwater sampling results, as discussed earlier, it is believed that there presently exists heavy metal contamination of soils and groundwater associated with this unit. Jacobs believes that there is currently adequate justification for further characterization of this unit as part of an RFI.

8.2.10 Clarifier Sludge Storage Tanks

Monsanto has stated that the Clarifier Sludge Storage Tanks, which have been removed, were apparently never used to store the clarifier sludge, but instead were reportedly used for the storage of used fuel oil. Inspection reports have stated, however, that the feed lines to these tanks were corroded by sludge from the clarifier. This indicates that clarifier sludge may have been stored in these tanks at one time. Due to the spill containment that was associated with this unit, the potential for a release of hazardous materials to the environment is currently considered to be low. Based on Jacobs' review of available information pertaining to the tank, including inspection schedule and procedures, Jacobs is recommending that no further actions be taken during the RFA.

8.3 Areas of Concern

8.3.1 Railroad Unloading Area

The railroad unloading area is where raw chemicals arriving by railcar are pumped from tanker cars to their raw material product tanks. This area is bermed and any spillage is directed to an underground stainless-steel tank. Due to the likelihood of periodic spillage during unloading of raw chemical materials in this area, the potential for present and past releases to unpaved soils surrounding the railroad tracks is considered to be moderate to high. This potential, in turn, introduces the possibility of soil contaminants leaching to the water table and for the generation of subsurface soil gas. In addition, the potential exists for a direct release to air of contaminated dust particles and volatile constituents of any spilled materials. In light of the above discussion, Jacobs recommends the following:

- o Surface soil samples should be collected from the unpaved soils on both sides of the railroad tracks. A full priority pollutant scan should be performed on these samples in an attempt to confirm or deny the presence of soil contamination in this area.

- o Groundwater samples should be collected from monitoring wells GM-1, GM-2, MW-12, and MW-14 and analyzed for priority pollutants. This resulting data should be further evaluated to aid in assessment of the contribution of the railroad unloading area to the groundwater contamination in this area.

8.3.2 Underground Storage Tanks

In a letter to Mr. Lyndall Harrington, EPA, in May 1988, Monsanto identified 32 underground storage tanks which were described as "leakers." All but two of these tanks have since been removed. The probability of past releases to soil and groundwater from these tanks is believed to be high. Physical evidence in the form of soil and groundwater sampling results has shown that releases from at least one of these tanks (T-31) have contaminated surrounding soil and groundwater. Based upon this conclusion, Jacobs recommends the following:

- o Soil core samples should be obtained from borings placed immediately adjacent to the former locations of the tanks where sampling has not been previously conducted. Care should be taken to obtain samples from the same depth range at which the tanks were located. In addition, the samples should be taken sufficiently close to where the tanks were located but not so close as to encounter fill material placed at the time of the tanks' removal. Due to the uncertainty regarding what chemicals were stored in individual tanks, a priority pollutant scan should be performed on all samples.

The existing groundwater monitoring well network at the facility is fairly extensive; therefore, Jacobs is not recommending additions to the network at this time in direct association with this unit. If, however, significant soil contaminant concentrations are discovered at individual former tank locations, placement of groundwater monitoring wells near these tanks may be appropriate during further investigation.

In the June 27, 1988 meeting between Monsanto and EPA, Monsanto stated that the facility was in the process of removing all remaining underground storage tanks at the plant. As a part of the removal process, Monsanto stated that soil analysis would be performed to detect any contamination caused by releases from these tanks. EPA should obtain and review all analytical results associated with removal of the tanks. If soil is found to be contaminated, additional investigation should be initiated with the ultimate goal of remediation of contamination caused by releases from the tanks.

8.3.3 Fire Training Area

The fire training area, located in the southeast portion of the facility, consists of a concrete lined pit surrounded by gravel covered soil. A centrally located drainage grate collects surface runoff/spillage and directs it through the plant's wastewater treatment system. During the training exercises, kerosene is poured on water contained in the pit and ignited. The fire is then extinguished using established fire fighting techniques. The potential exists for contamination of gravel lined soils surrounding the concrete burn pit. This conclusion is based primarily on the potential for spillage during placement of flammables, including kerosene, into the burn pit. The potential for soil contamination introduces the potential for leaching of contaminants to the water table and for the generation of subsurface soil gas. In addition, the potential exists for a direct release to air of contaminated dust particles and volatile constituents of the materials in the burn pit. In light of the above discussion, Jacobs recommends the following:

- Surficial soil sampling should be conducted and resulting samples analyzed for priority pollutants on all four sides of the burn pit. The purpose is to confirm or deny the presence of any soil contamination in the area.

- Monsanto should regularly inspect the structural integrity of the pit's concrete lining, which includes checking for cracking or degradation of the concrete. This will help ensure that cracking does not develop which would allow direct releases of contaminants to underlying soils.

8.3.4 Lasso Production Area

The Lasso Production Area is where Monsanto produces its Lasso brand herbicide. Some soil and groundwater contamination has been indicated in previous investigations to be originating from this area. Due to the documented contamination associated with this area, as discussed above, Jacobs recommends the following:

- o As part of an RFI, Monsanto should define the vertical and horizontal extent of both soil and groundwater contamination associated with the Lasso production area.

8.4 Summary of Recommendations for Further Actions

Based on the results of the Preliminary Assessment, it is recommended that additional investigation be performed at the Monsanto-Queeny Plant under a RCRA Facility Investigation (RFI). This additional investigation should take several forms. Table 4 will summarize specific recommendations for further actions.

As has been stated, historical information concerning waste management practices at the facility is very limited; thus, this assessment is focused on recent waste management practices utilized at the site. Because Monsanto has operated at this location since 1901, it is believed that the potential for contamination due to past waste management practices is moderate to high. Monsanto should research company records and, if possible, interview both current and past employees to obtain information on areas of past waste management. These areas would include, but are not limited to, container storage areas, past wastewater discharge points, other waste storage tanks, or any other areas known to handle wastes. Such information could be used to assess the probability of past contamination and the need for further investigation. Included should be any information available to Monsanto concerning historical drainage paths at the facility. Likewise, this information could be used to identify areas of potential contamination caused by drainage of spills which occurred prior to installation of the self-contained sewer system. Jacobs has also recommended that Monsanto provide further information concerning various aspects of the units and areas discussed in Sections 5, 6, and 7. Sampling should be conducted in association with several areas to document the potential for releases. Table 4 summarizes those areas for which sampling is recommended.

An RFI for the Monsanto-Queeny Plant is recommended. Table 4 indicates those areas identified for further investigation under an RFI. Groundwater has been identified as requiring further study. The report entitled, "Review of Hydrogeologic Investigations at the J. F. Queeny Plant," prepared by Geraghty & Miller, Inc., dated June 1988 (Reference 1), provides analytical results which document groundwater contamination at areas throughout the plant. The RFI should characterize the vertical and horizontal extent of such contamination. In addition, as part of the RFI, Monsanto should review and supplement if necessary, existing hydrogeologic information to define site groundwater flow patterns as influenced by seasonal variations, the Missisippi River, and local geology. The site hydrogeologic characterization should also include the installation of groundwater monitoring wells which extend into the bedrock aquifer in order that groundwater flow in the bedrock aquifer can be determined and contaminant migration to this aquifer can be investigated. This information would be used to aid in designing any corrective action program determined to be necessary.

9.0 REFERENCES

(1) Geraghty & Miller, Inc. Review of Hydrogeologic Investigations at the J. F. Queeny Plant, Monsanto Chemical Company, St. Louis, Missouri. June 1988.

(2) Monsanto Chemical Company. RCRA Part B Permit Application - Monsanto-Queeny Plant. November 7, 1984.

(3) Missouri Department of Natural Resources. Hazardous Waste Compliance Inspection Report, Monsanto-Queeny Plant. April 24, 1986

(4) O. H. Materials Co. Final Report for Monsanto Industrial Chemicals Company, J. F. Queeny Plant. July 17, 1985.

(5) Saeger, William E.; Geologic and Subsurface Investigation of the St. Louis, Missouri Metropolitan Area. May 1975.

(6) Terran Corporation. Trial Burn Plan, Monsanto Chemical Company, Queeny Plant, CAC Incinerator. May 1988.

(7) Perica, Kenneth M.; Letter to David Wagoner, USEPA - Region VII. May 13, 1988.

(8) Boland, Robert F.; Letter to Lyndell Harrington, USEPA - Region VII. May 13, 1988.

(9) Perica, Kenneth M.; Letter to John Doyle, Missouri Department of Natural Resources. May 1, 1986.

(10) U. S. EPA Summary for 6-27-88 Meeting with Monsanto and Geraghty & Miller, Inc. Prepared by Jacobs Engineering Group, Inc.

(11) Merck & Company, Inc.; The Merck Index. 1983.

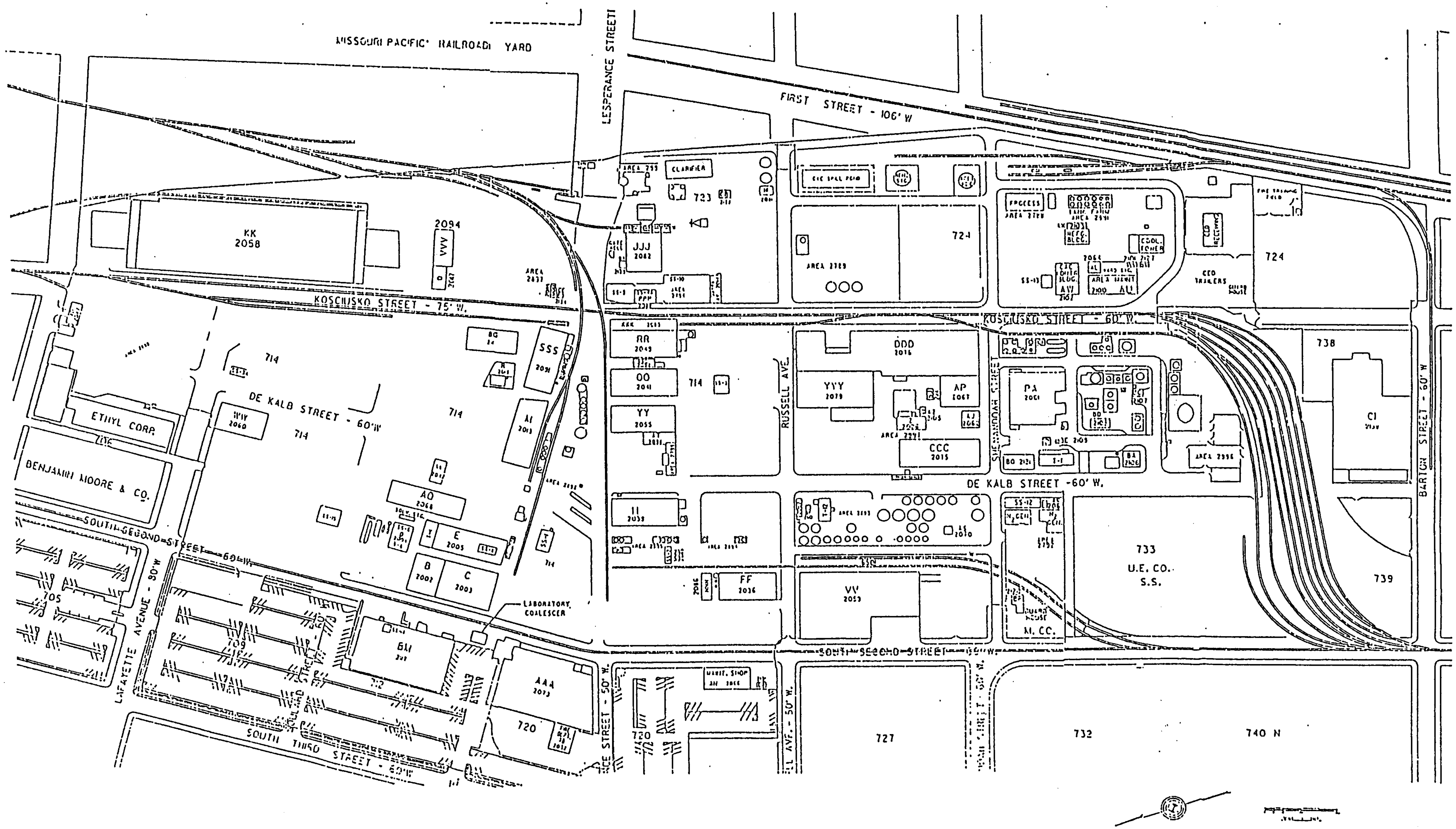
(12) U. S. EPA - Region VII. Quality Assurance Project Plan for Performing RCRA Facility Assessments. Prepared by Jacobs Engineering Group, Inc. June 26, 1987.

(13) U. S. EPA RCRA Facility Assessment Guidance. October 1986.

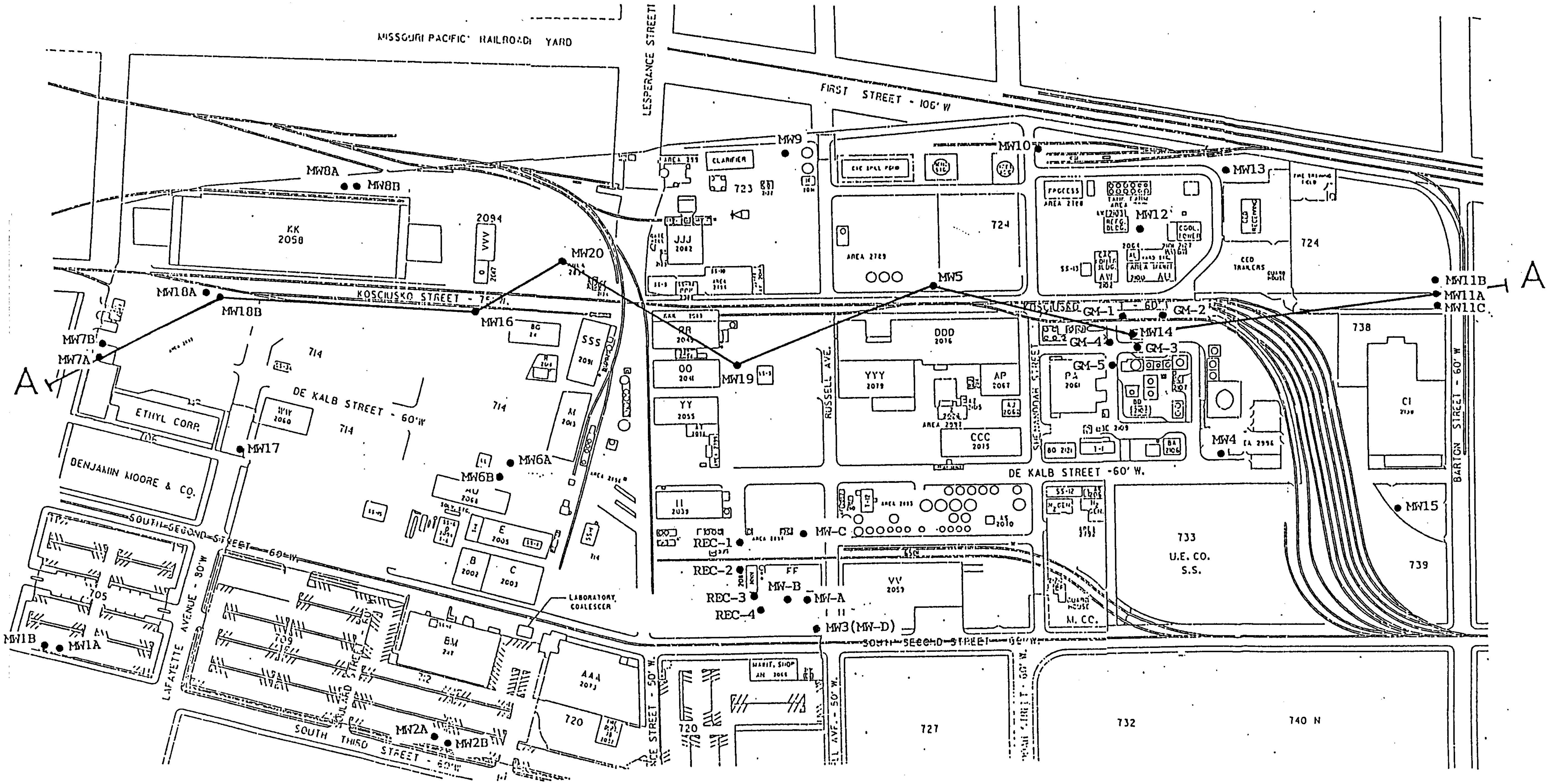
FIGURES

FINAL RCRA FACILITY ASSESSMENT REPORT
MONSANTO-QUEENY PLANT
ST. LOUIS, MISSOURI

Facility Location Map	WORK ASSIGNMENT NO. 667
Monsanto-Queeny Plant St. Louis, MO	JACOBS PROJECT NO. 05-B667-00
JE JACOBS ENGINEERING GROUP INC. ENVIRONMENTAL SYSTEMS DIVISION	TES IV
DRAWN BY: BJR DATE: 12-8-88	FIGURE NO.
CHECKED BY: TDH DATE: 12-8-88	1



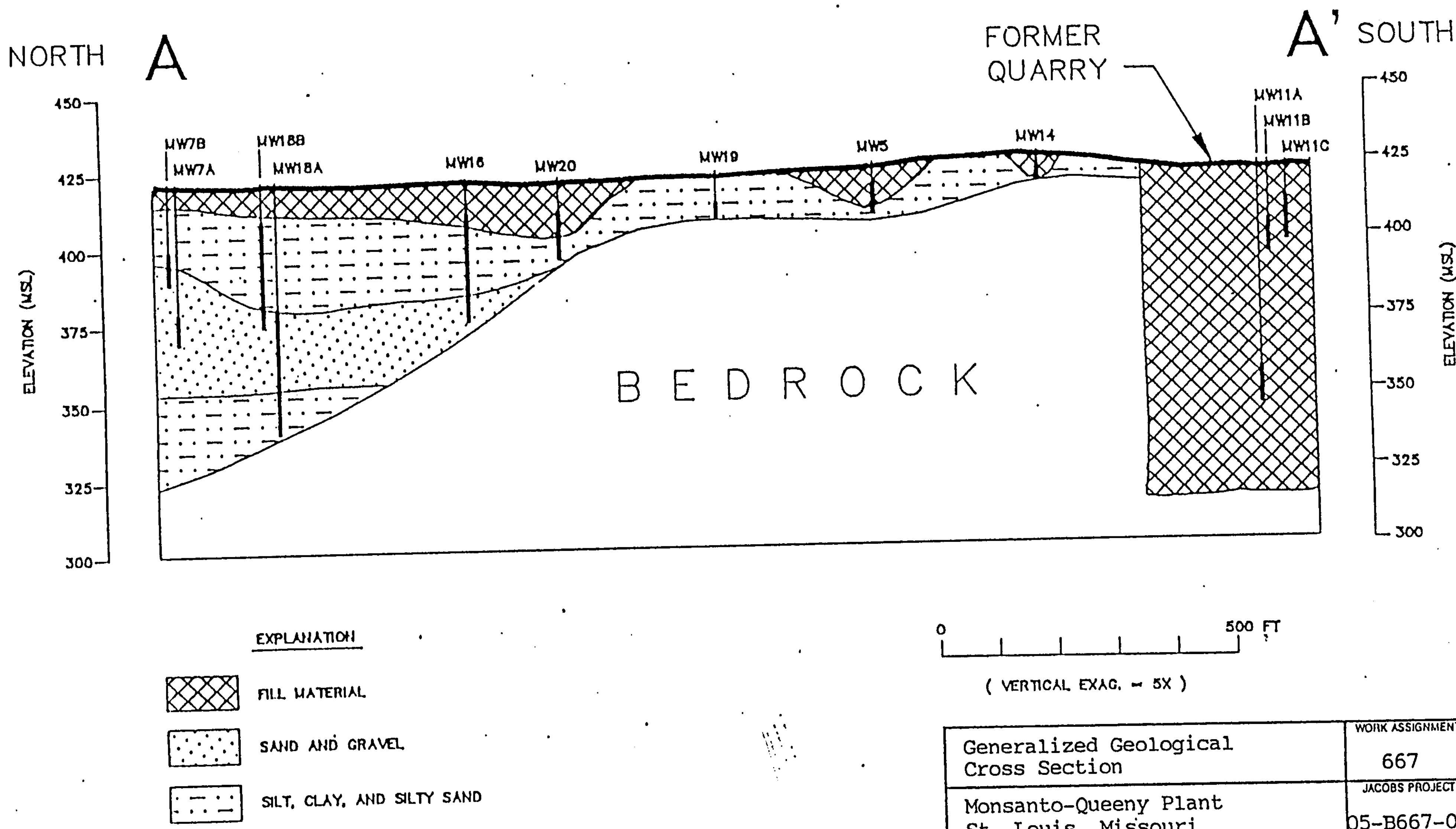
Facility Map	WORK ASSIGNMENT NO 667
Monsanto-Queeny Plant St. Louis, Missouri	JACOBS PROJECT NO 05-B667-00
JE JACOBS ENGINEERING GROUP INC. ENVIRONMENTAL SYSTEMS DIVISION	TES IV
DRAWN BY: BJR DATE: 10-7-88 CHECKED BY: TDH DATE: 10-7-88	FIGURE NO 2



• Monitoring Wells

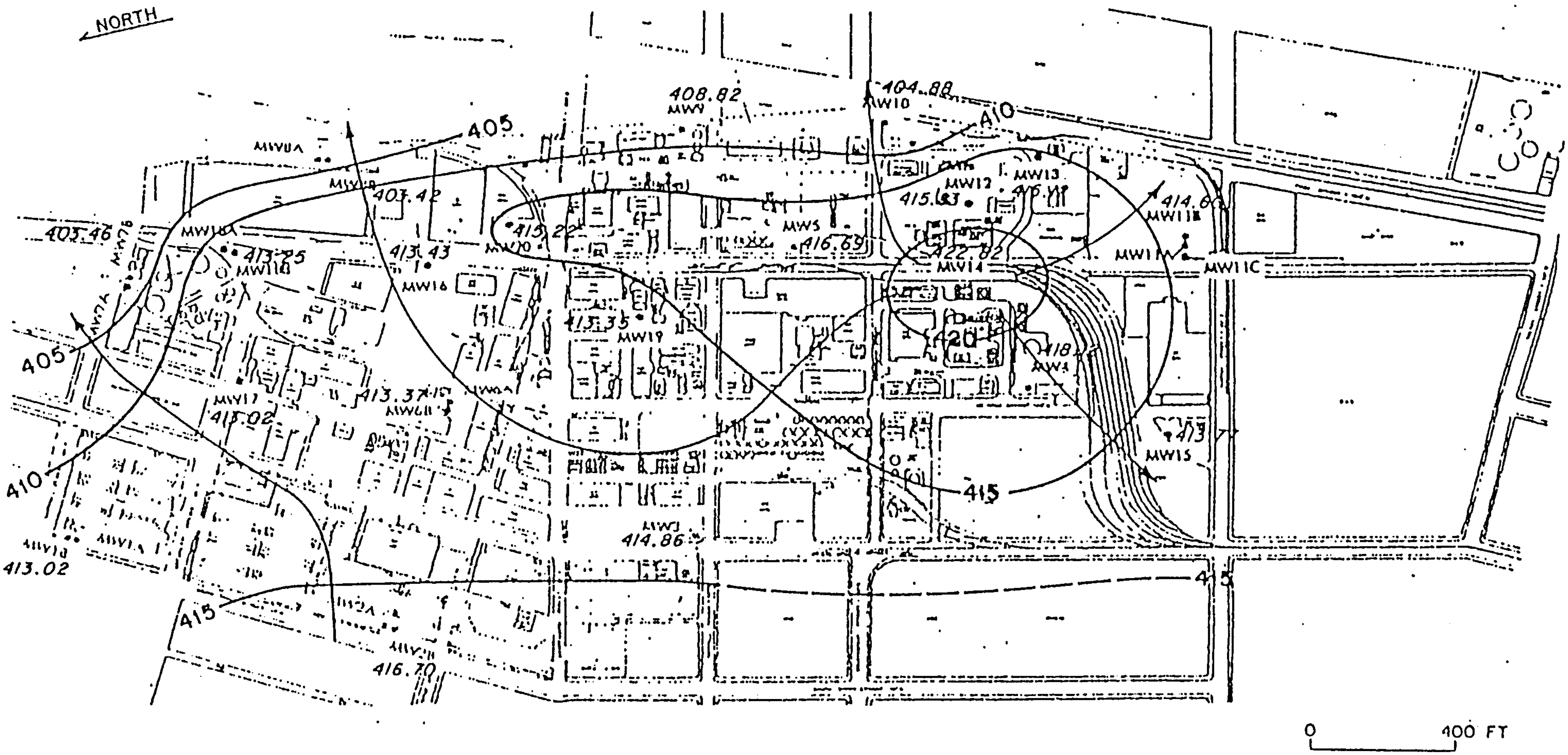
Adapted from Figure 1, Reference 1

Monitoring Well Locations:	WORK ASSIGNMENT NO. 667
Monsanto-Queeny Plant St. Louis, Missouri	JACOBS PROJECT NO. 05-B667-00
JE JACOBS ENGINEERING GROUP INC. ENVIRONMENTAL SYSTEMS DIVISION	TES IV
DRAWN BY: BJR DATE: 9-23-88 CHECKED BY: TDH DATE: 9-23-88	FIGURE NO. 3



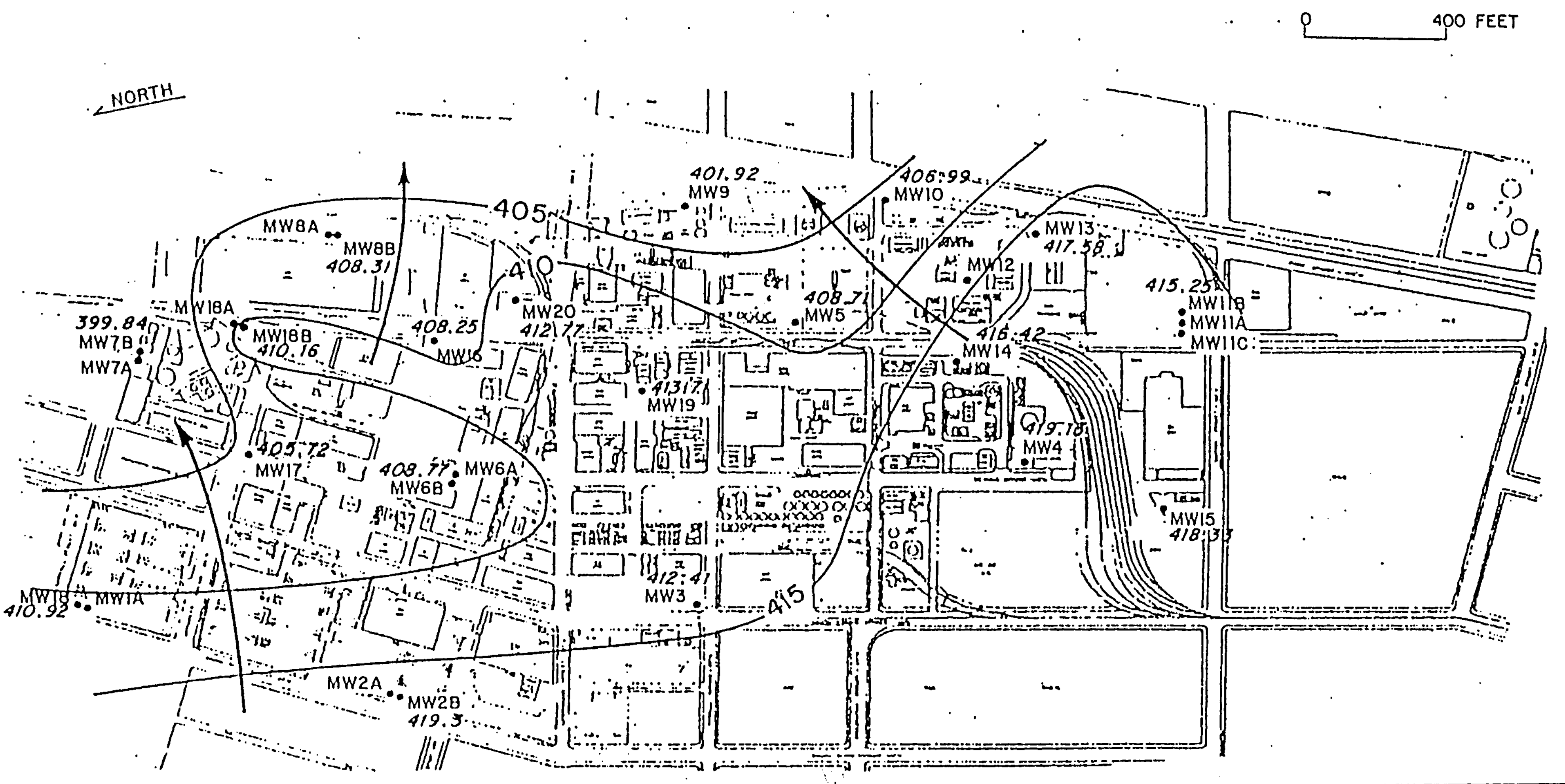
Adapted from Figure 2, Reference 1

Generalized Geological Cross Section	WORK ASSIGNMENT NO. 667
Monsanto-Queeny Plant St. Louis, Missouri	JACOBS PROJECT NO. 05-B667-00
JE JACOBS ENGINEERING GROUP INC. ENVIRONMENTAL SYSTEMS DIVISION	TES IV
DRAWN BY: BJR DATE: 9-26-88	FIGURE NO. 4
CHECKED BY: TDH DATE: 9-26-88	



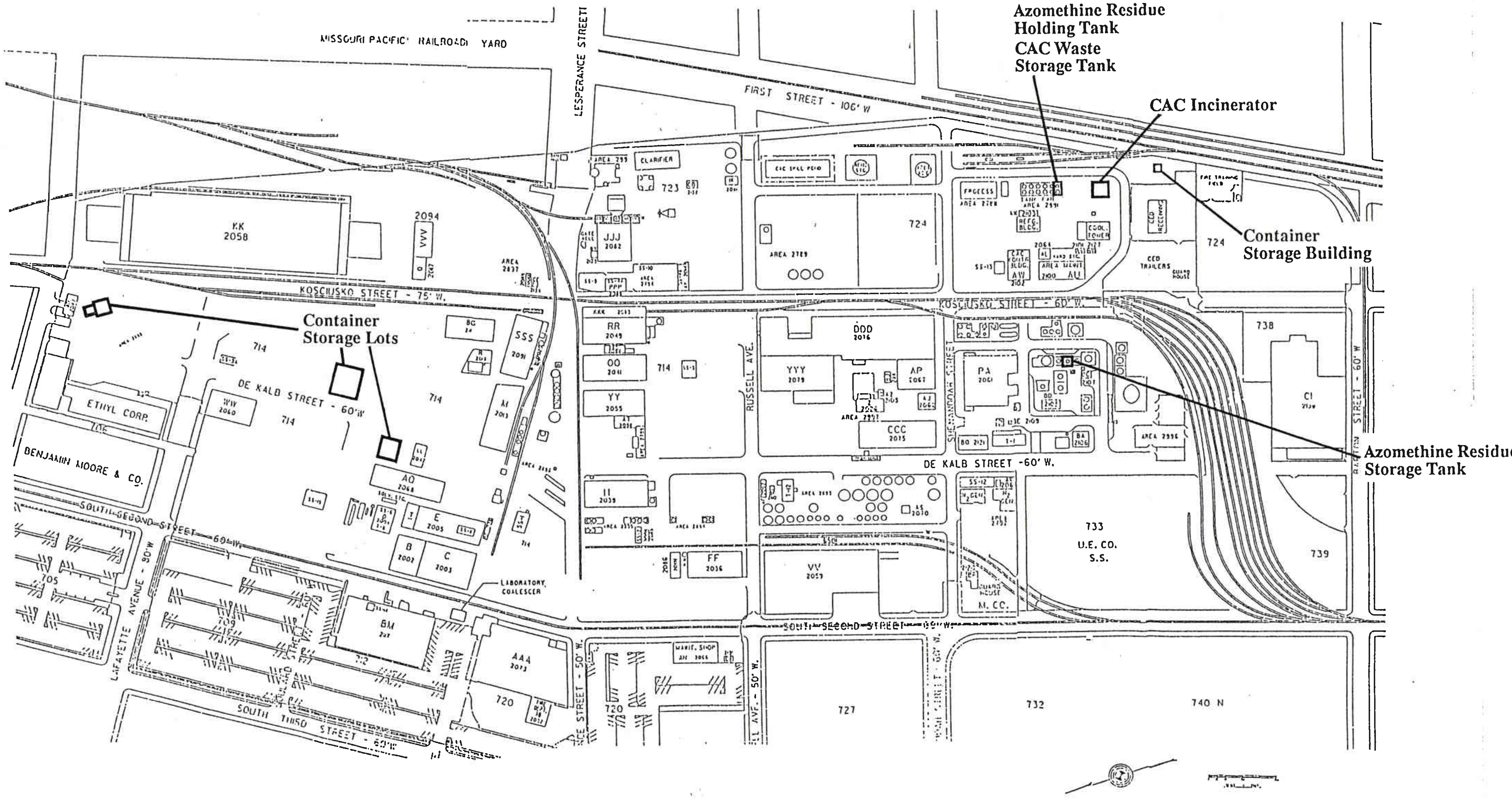
Adapted from Figure 3, Reference 1

Groundwater Elevation Contours April 1985	WORK ASSIGNMENT NO. 667
Monsanto-Queeny Plant St. Louis, Missouri	JACOBS PROJECT NO. 05-B667-00
JE JACOBS ENGINEERING GROUP INC. ENVIRONMENTAL SYSTEMS DIVISION	TES IV
DRAWN BY: BJR DATE: 10-7-88	FIGURE NO. 5
CHECKED BY: TDH DATE: 10-7-88	

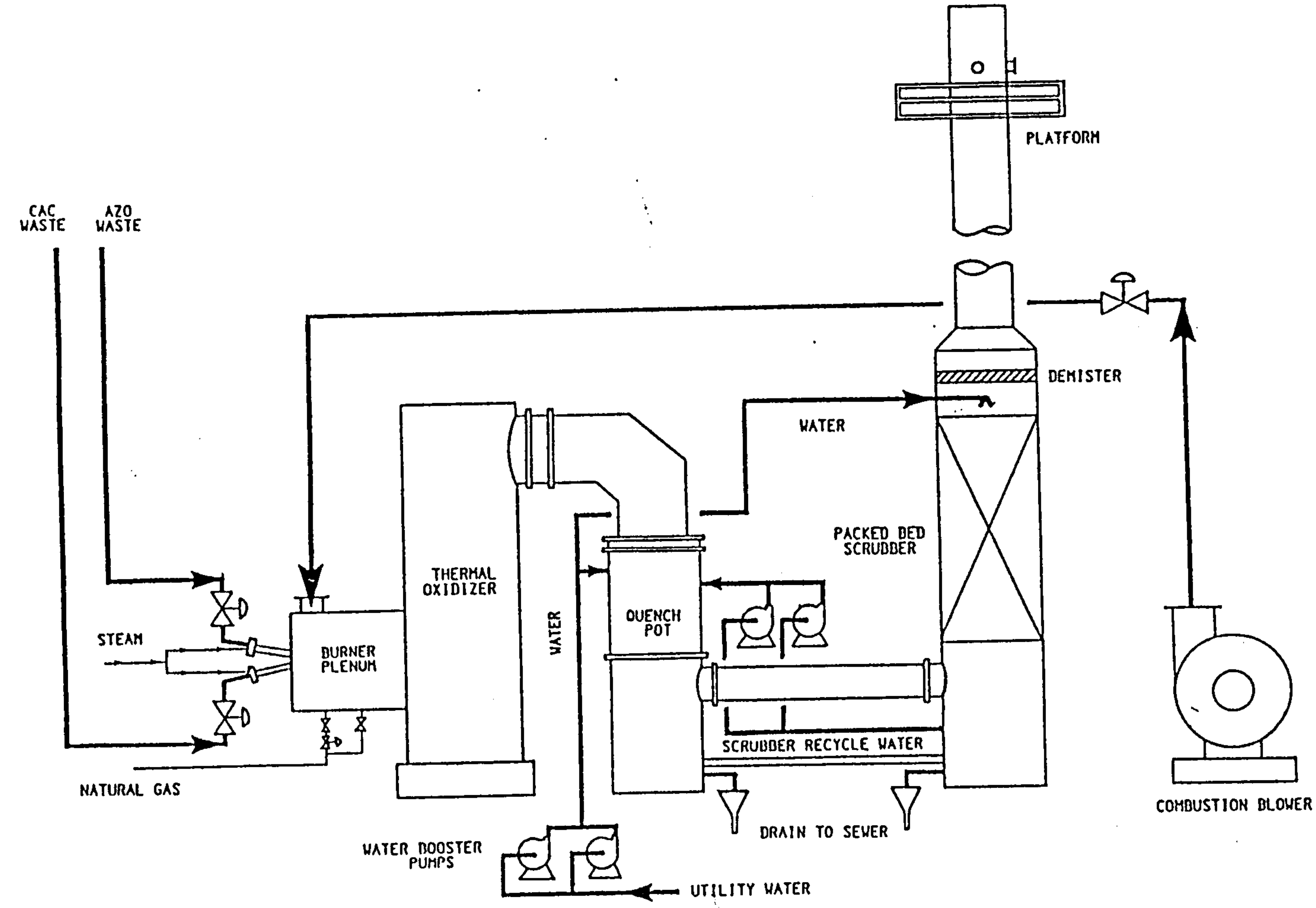


Adapted from Figure 5, Reference 1

Groundwater Elevation Contours September 1987	WORK ASSIGNMENT NO. 667
Monsanto-Queeny Plant St. Louis, Missouri	JACOBS PROJECT NO. 05-B667-00
JE JACOBS ENGINEERING GROUP INC. ENVIRONMENTAL SYSTEMS DIVISION	TES IV
DRAWN BY: BJR DATE: 10-7-88	FIGURE NO. 6
CHECKED BY: TDH DATE: 10-7-88	

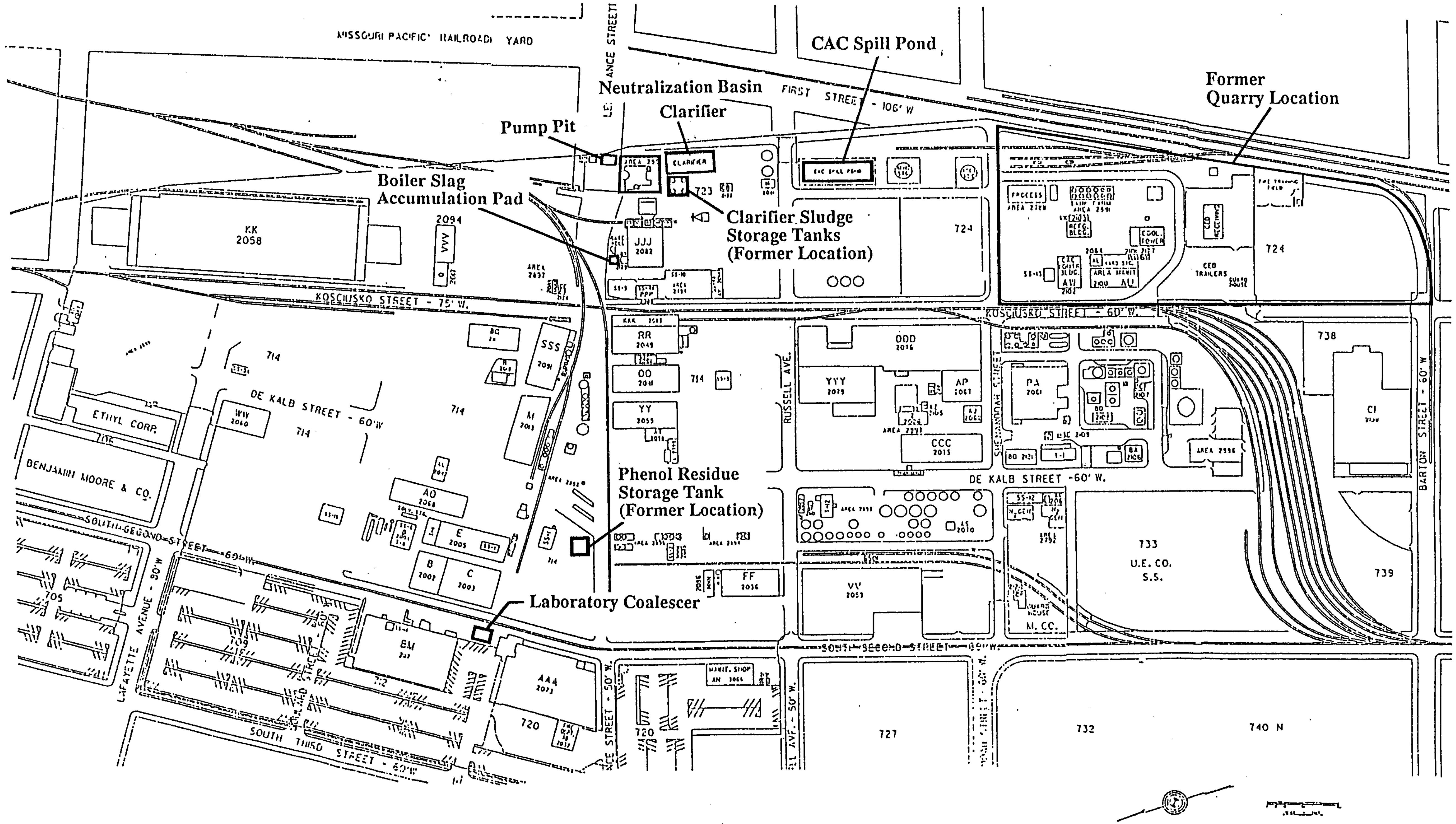


RCRA-Regulated Unit Locations	WORK ASSIGNMENT NO 667
Monsanto-Queeny Plant St. Louis, Missouri	JACOBS PROJECT NO 05-B667-00
JE JACOBS ENGINEERING GROUP INC. ENVIRONMENTAL SYSTEMS DIVISION	TES IV
DRAWN BY: BJR DATE: 12-20-88	FIGURE NO
CHECKED BY: TDH DATE: 12-20-88	7

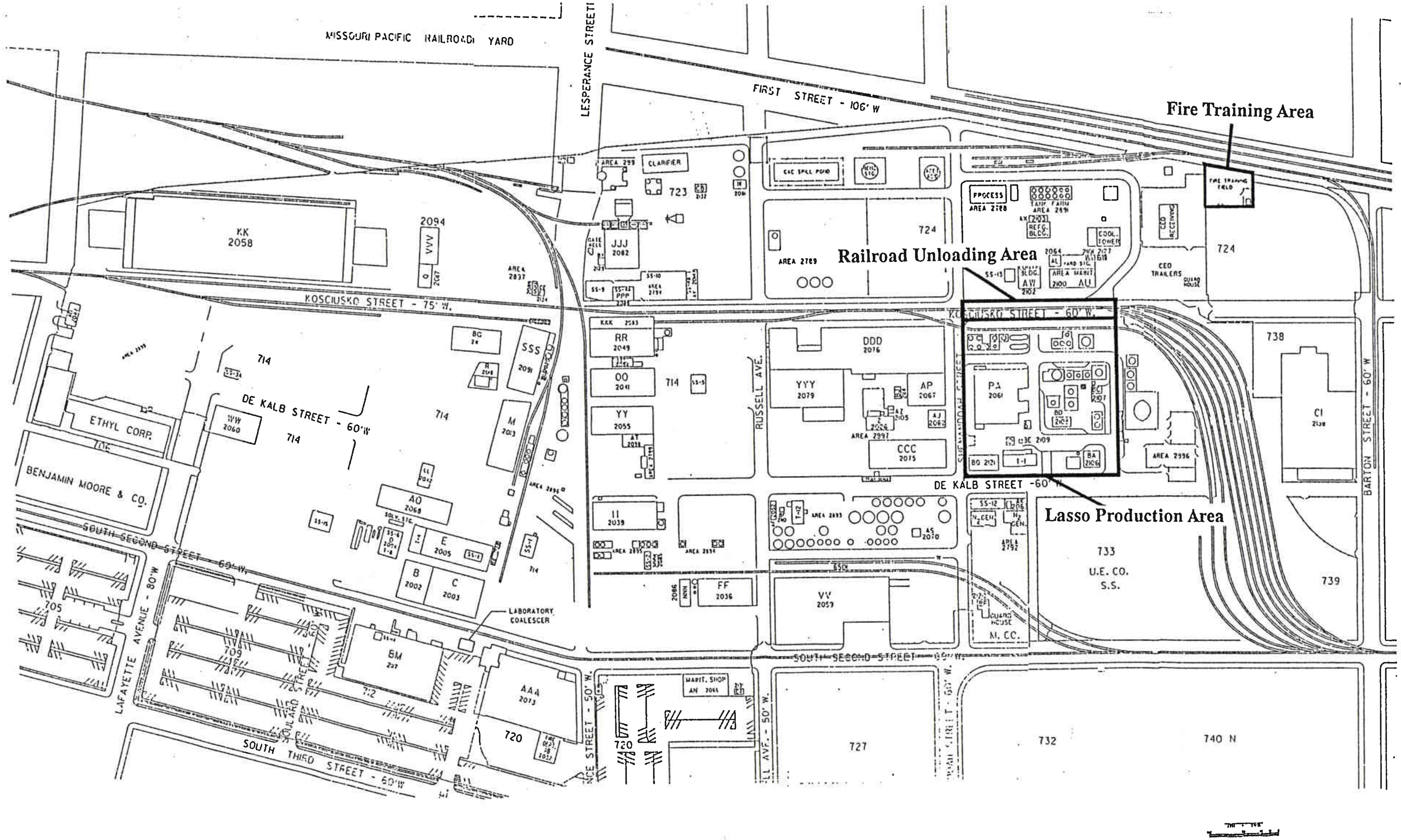


Source:
Trial Burn Plan for the
Monsanto Chemical Company,
Terran Corporation

Schematic Diagram of the CAC Incinerator System	WORK ASSIGNMENT NO. 667
Monsanto-Queeny Plant St. Louis, Missouri	JACOBS PROJECT NO. 05-B667-00
JE JACOBS ENGINEERING GROUP INC. ENVIRONMENTAL SYSTEMS DIVISION	TES IV
DRAWN BY: BJR DATE: 1-9-89	FIGURE NO. 8
CHECKED BY: DLF DATE: 1-9-89	



SWMU Locations	WORK ASSIGNMENT NO 667
Monsanto-Queeny Plant St. Louis, Missouri	JACOBS PROJECT NO 05-B667-00
JE JACOBS ENGINEERING GROUP INC. ENVIRONMENTAL SYSTEMS DIVISION	TES IV
DRAWN BY: BJR DATE: 12-20-88	FIGURE NO 9
CHECKED BY: TDH DATE: 12-20-88	

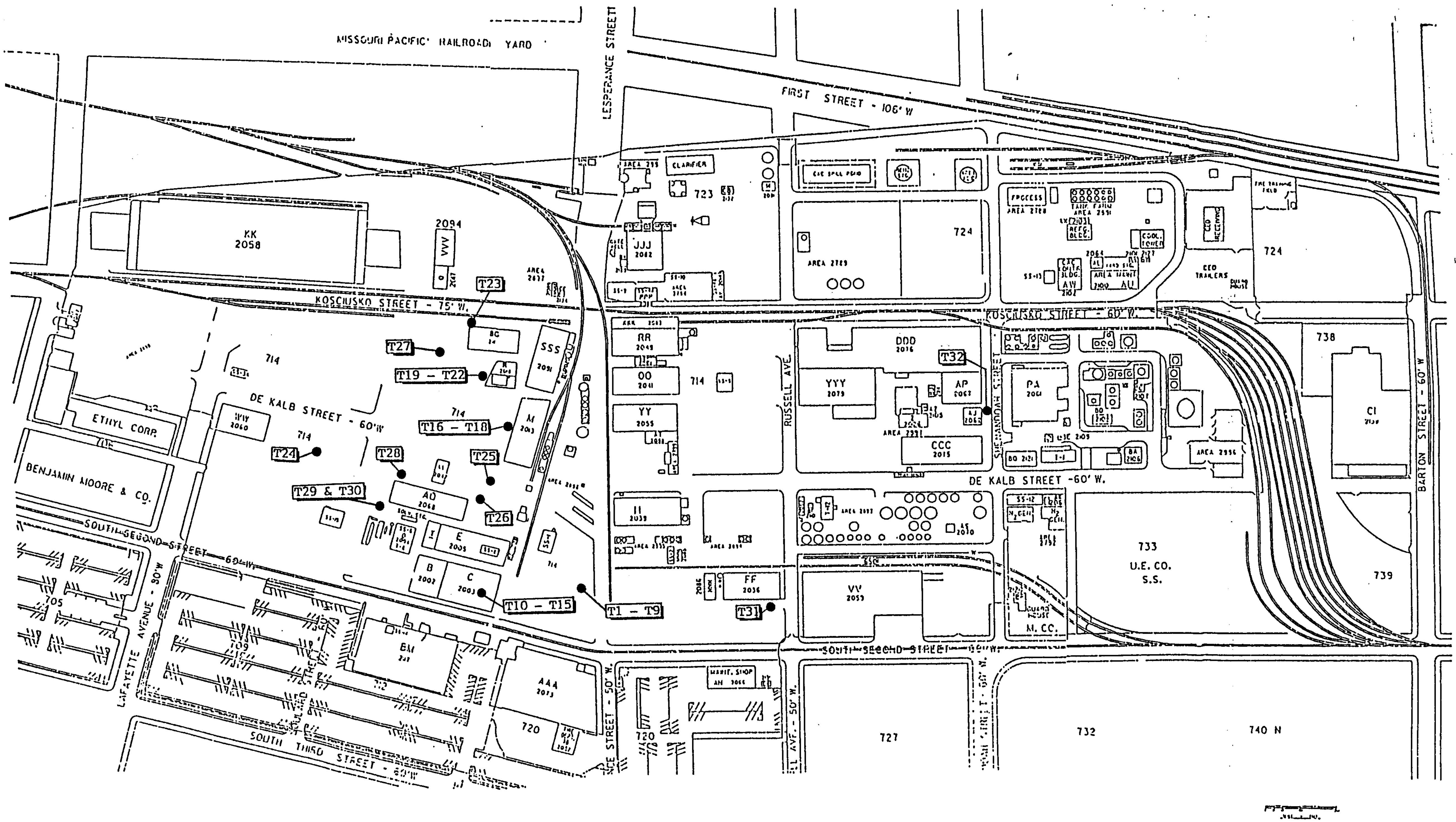


Area of Concern Locations

Monsanto-Queeny Plant
St. Louis, Missouri

JACOBS ENGINEERING GROUP INC.
ENVIRONMENTAL SYSTEMS DIVISION

WORK ASSIGNMENT NO	667
JACOBS PROJECT NO	05-B667-00
	TES IV
DRAWN BY: BJR	DATE 2/21/89
CHECKED BY: DLF	DATE 2/21/89
FIGURE NO	10



● Underground Tank Location

Adapted from Reference 3

Various Underground Tank Locations	WORK ASSIGNMENT NO 667
Monsanto-Queeny St. Louis, Missouri	JACOBS PROJECT NO. 05-B667-00
JE JACOBS ENGINEERING GROUP INC. ENVIRONMENTAL SYSTEMS DIVISION	TES IV
DRAWN BY: BJR DATE: 1-18-89 CHECKED BY: DLF DATE: 1-18-89	FIGURE NO. 11

TABLES

FINAL RCRA FACILITY ASSESSMENT REPORT
MONSANTO-QUEENY PLANT
ST. LOUIS, MISSOURI

TABLE 1

CAC WASTE CHARACTERISTICS

PARAMETER	CAC RESIDUE
Physical	
Btu content	8260
Viscosity	1.56 cS +/- 19%
Specific gravity	1.41
Chemical	
Elemental	
Carbon	34.5% +/- 3%
Hydrogen	3.9% +/- 3%
Oxygen (by difference)	23.2%
Chlorine	38.4% +/- 4%
Metals	
Arsenic	<0.20 ppm
Cadmium	<0.07 ppm
Chromium	0.27 ppm
Lead	<6.2 ppm
Organic constituents	
Acetyl chloride (CAS# 75-36-5)	34.5% +/-19%
Propargyl chloride	0.5% +/- 40%
Butyrolacetone	2.4% +/- 29%
2-Chloroethyl-4-chlorobutyrate	7.1% +/- 23%
Acetic acid	2.0% +/- 45%
1,2-Dichloroethane	0.24% +/-17%
Acetic anhydride	3.3% +/- 9%
Chloroacetyl chloride	11.1% +/- 11%
Chloromethane	88 ppm +/-31%
Dichloromethane (CAS# 75-09-2)	35 ppm +/-43%
Chloroform (CAS# 67-66-3)	127 ppm+/-24%
Carbon tetrachloride (CAS# 56-23-5)	67 ppm+/-46%
Tetrachloroethane (CAS# 630-20-6 or 79-34-5)	37 ppm+/-19%

TABLE 2

VARIOUS UNDERGROUND STORAGE TANK INFORMATION

Tank No.	Bldg. Near	Size in Gallons	Last Chemical Stored	Date Installed	Date Abandoned
T-1	AA	1,500	ethanol	unknown	post-1970
T-2	AA	1,500	unknown	unknown	pre-1972
T-3	AA	1,500	methanol	unknown	post-1970
T-4	AA	1,500	ethanol	unknown	post-1970
T-5	AA	1,500	butanol	1/35	post-1970
T-6	AA	1,500	unknown	2/35	pre-1972
T-7	AA	1,500	ethanol	unknown	post-1970
T-8	AA	20,000	methanol	6/64	post-1970
T-9	AA	1,500	unknown	unknown	pre-1969
T-10	C	5,000	unknown	unknown	pre-1969
T-11	C	1,500	unknown	5/36	pre-1969
T-12	C	1,500	unknown	5/36	pre-1969
T-13	C	3,000	unknown	unknown	pre-1966
T-14	C	8,000	unknown	unknown	pre-1969
T-15	C	2,000	unknown	5/36	pre-1969
T-16	M	8,000	unknown	unknown	pre-1967
T-17	M	8,000	unknown	unknown	pre-1967
T-18	M	3,000	unknown	unknown	pre-1967
T-19	R	3,000	unknown	unknown	pre-1966
T-20	R	1,000	unknown	unknown	pre-1966
T-21	R	3,000	unknown	unknown	pre-1966
T-22	R	5,000	methanol	unknown	1982
T-23	BG	1,500	unknown	unknown	pre-1967
T-24	W	10,000	unknown	11/37	11/52
T-25	J	8,000	unknown	2/39	3/66
T-26	E	10,000	unknown	unknown	pre-1966
T-27	T	10,000	unknown	unknown	pre-1967
T-28	AQ	10,000	me-et-alcohol	12/32	pre-1967
T-29	D	5,000	unknown	unknown	pre-1966
T-30	D	5,000	unknown	unknown	pre-1966
T-31	FF	20,000	PCE	1948	1/86
T-32	AP	1,000	gasoline	1/77	6/85

TABLE 3

CHEMICAL CONSTITUENTS IN MONITORING WELLS
LASSO PRODUCTION AREA

Parameter	Detection Limits (mg/L)	Well Designation GM-1	GM-2	GM-3	GM-4	GM-5	MW-14
Alachlor	3	169	162	6	ND	4	1,010
Chlorobenzene	50	143	114	42	ND	770	409
2,6-Diethylaniline	3	ND	ND	44	1,807	ND	23
Acetyl alachlor	10	20	24	29	ND	ND	67
CP31679	10	20	10	ND	ND	ND	ND
Unidentified high boilers	–	ND	ND	ND	1,785	2	99

ND Not detected.

– Not determined.

mg/L Milligrams per liter.

Samples were collected by Geraghty & Miller, Inc. and analyzed by Monsanto.

Table adapted from Table 11, Reference 1

TABLE 4

SUMMARY OF RECOMMENDED FURTHER ACTIONS
FOR SPECIFIC UNITS

WASTE MANAGEMENT UNITS/ AREAS OF CONCERN	RCRA REGULATED	RELEASE POTENTIAL (LOW, MODERATE, HIGH)	JACOBS' RECOMMENDATIONS FOR FURTHER ACTIONS
Phenol Residue Storage Tank	No	Low to Moderate	Sampling of surficial soils surrounding former tank location
Boiler Slag Accumulation Pad	No	Low	Further investigation for possible inclusion in RFI
Self-contained Sewer System	No	Moderate to High	Sewer leak testing; re-evaluation for possible inclusion in RFI
Former Quarry Location	No	Moderate to High	Further characterization under RFI
Railroad Unloading Area	No	Moderate to High	Sampling of surficial soils in this area
Underground Storage Tanks	No	High	Soil core sampling from subsurface soils surrounding former tank locations
Fire Training Area	No	Moderate to High	Sampling of surficial soils surrounding concrete pit
Lasso Production Area	No	High	Characterization of extent of contamination under RFI
Groundwater (Facility-wide)	No	High	Further investigation under RFI to determine extent of contamination

APPENDIX A

RCRA PART A PERMIT APPLICATION

FINAL RCRA FACILITY ASSESSMENT REPORT
MONSANTO-QUEENY PLANT
ST. LOUIS, MISSOURI

Please print or type in the unshaded areas only
(fill–in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved OMB No. 158-R0175

FORM 1 GENERAL — EPA — U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION

Consolidated Permits Program
(Read the "General Instructions" before starting.)

I. EPA I.D. NUMBER: F M O D 0 0 4 9 5 4 1 1 1 D

LABEL ITEMS

I. EPA I.D. NUMBER: MOD004954111

III. FACILITY NAME: MONSANTO COMPANY

V. FACILITY MAILING ADDRESS: 1700 SOUTH SECOND STREET, ST. LOUIS, MO 63177

VI. FACILITY LOCATION: 1700 SOUTH SECOND STREET, ST. LOUIS, MO 63177

GENERAL INSTRUCTIONS

If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill–in area below. Also, if any of the preprinted data is absent *(the area to the left of the label space lists the information that should appear)*, please provide it in the proper fill–in area(s) below. If the label is complete and correct, you need not complete Items I, III, V, and VI *(except VI-B which must be completed regardless)*. Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold–faced terms.

SPECIFIC QUESTIONS	YES	NO	FORM ATTACHED
A. Is this facility a publicly owned treatment works which results in a discharge to waters of the U.S.? (FORM 2A)		X	
B. Does or will this facility *(either existing or proposed)* include a concentrated animal feeding operation or aquatic animal production facility which results in a discharge to waters of the U.S.? (FORM 2B)		X	
C. Is this a facility which currently results in discharges to waters of the U.S. other than those described in A or B above? (FORM 2C)		X	
D. Is this a proposed facility *(other than those described in A or B above)* which will result in a discharge to waters of the U.S.? (FORM 2D)		X	
E. Does or will this facility treat, store, or dispose of hazardous wastes? (FORM 3)	X		X
F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)		X	
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)		X	
H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)		X	
I. Is this facility a proposed stationary source which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		X	
J. Is this facility a proposed stationary source which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		X	

III. NAME OF FACILITY

1 SKIP: MONSANTO CO.-J. F. QUEENY PLANT

IV. FACILITY CONTACT

A. NAME & TITLE (last, first, & title)	B. PHONE (area code & no.)
2 R F BOLAND-ENVIRO. PROT. SUPT.	314 622 1641

V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX: 3 1700 S. SECOND ST.

B. CITY OR TOWN	C. STATE	D. ZIP CODE
4 ST. LOUIS	MO	63177

VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER: 5 1700 S. SECOND ST.

B. COUNTY NAME: NOT APPLICABLE

C. CITY OR TOWN	D. STATE	E. ZIP CODE	F. COUNTY CODE (if known)
6 ST. LOUIS	MO	63177	

ATTACHMENT A

FORM I - PART X

The J. F. Queeny Plant has over 470 air source operations that are registered with the City of St. Louis, therefore, these are not included.

The J. F. Queeny Plant has no NPDES permit or a direct discharge. The plant discharges to the Metropolitan St. Louis Sewer District which does not operate a permitting system to its users.

Form 1 - Part XI

LEGEND

~~1. Drum Storage Lot (90 ft. x 90 ft.)~~

~~2. AZO Residue Storage Tank (12,000 gal.)~~

~~3. Phenol Residue Storage Tank (15,000 gal.)~~

~~4. Spill Control Clarifier (under construction)~~

~~5. Neutralization Basin (40 ft. x 40 ft.)~~

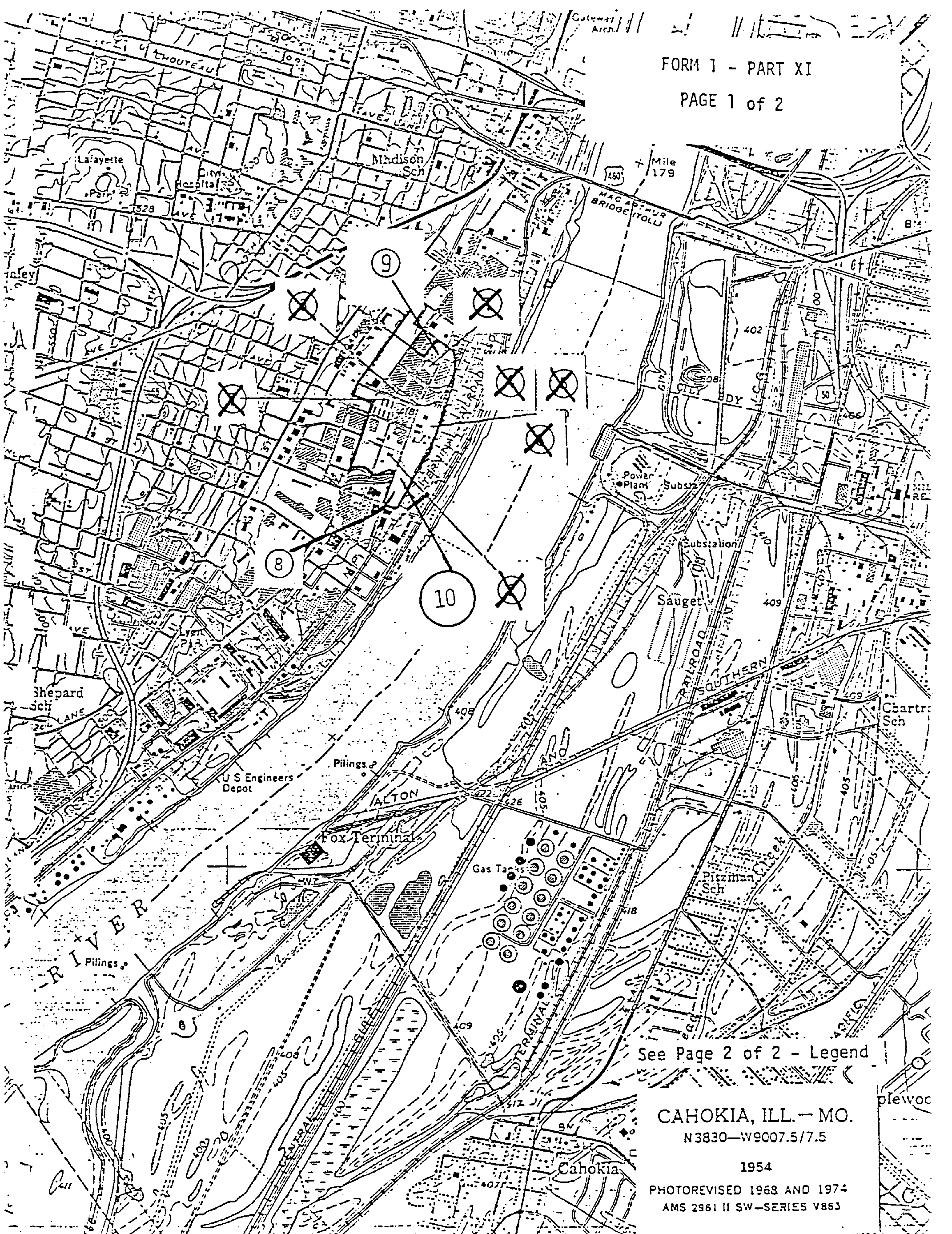
~~6. Clarifier Waste Tank Farm (under construction)~~

~~7. Laboratory Separator (10 ft. x 20 ft.)~~

8. CAC Oxidizer (30 ft. x 30 ft.)

9. CONTAINER STORAGE LOT (31 ft. x 49 ft.)

10. CAC RESIDUE STORAGE TANK (12,500 gal.)


Chouteau
Lafayette
Park
City
Hospital
Madison
Sch
Mile
179
MAC ARTHUR
BRIDGE (TOLL)
9
8
10
Power
Plant
Substa
Substation
Sauget
Shepard
Sch
U S Engineers
Depot
Pilings
ALTON
Fox Terminal
Gas Tanks
SOUTHERN
RAILROAD
Pittzman
Sch
RIVER
Pilings
Cahokia
See Page 2 of 2 - Legend
CAHOKIA, ILL.—MO.
N3830—W9007.5/7.5
1954
PHOTOREVISED 1968 AND 1974
AMS 2961 II SW—SERIES V863

Please print or type in the unshaded areas only
(fill-in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved OMB No. 158-S80004

FORM 3 RCRA

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

HAZARDOUS WASTE PERMIT APPLICATION

Consolidated Permits Program

(This information is required under Section 3005 of RCRA.)

I. EPA I.D. NUMBER

F M O D O O 4 9 5 4 1 1 1

FOR OFFICIAL USE ONLY

APPLICATION APPROVED	DATE RECEIVED (yr., mo., & day)	COMMENTS

II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below *(mark one box only)* to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA I.D. Number, or if this is a revised application, enter your facility's EPA I.D. Number in Item I above.

A. FIRST APPLICATION *(place an "X" below and provide the appropriate date)*

☐ 1. EXISTING FACILITY *(See instructions for definition of "existing" facility. Complete item below.)*

☐ 2. NEW FACILITY *(Complete item below.)*

C 8 | YR. | MO. | DAY | FOR EXISTING FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED *(use the boxes to the left)*

| YR. | MO. | DAY | FOR NEW FACILITIES PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR IS EXPECTED TO BEGIN

B. REVISED APPLICATION *(place an "X" below and complete Item I above)*

X 1. FACILITY HAS INTERIM STATUS

☐ 2. FACILITY HAS A RCRA PERMIT

III. PROCESSES – CODES AND DESIGN CAPACITIES

A. PROCESS CODE – Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the code*(s)* in the space provided. If a process will be used that is not included in the list of codes below, then describe the process *(including its design capacity)* in the space provided on the form *(Item III-C)*.

B. PROCESS DESIGN CAPACITY – For each code entered in column A enter the capacity of the process.
1. AMOUNT – Enter the amount.
2. UNIT OF MEASURE – For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Storage:		
CONTAINER *(barrel, drum, etc.)*	S01	GALLONS OR LITERS
TANK	S02	GALLONS OR LITERS
WASTE PILE	S03	CUBIC YARDS OR CUBIC METERS
SURFACE IMPOUNDMENT	S04	GALLONS OR LITERS
Disposal:		
INJECTION WELL	D79	GALLONS OR LITERS
LANDFILL	D80	ACRE-FEET *(the volume that would cover one acre to a depth of one foot)* OR HECTARE-METER
LAND APPLICATION	D81	ACRES OR HECTARES
OCEAN DISPOSAL	D82	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	D83	GALLONS OR LITERS
Treatment:		
TANK	T01	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	T02	GALLONS PER DAY OR LITERS PER DAY
INCINERATOR	T03	TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR
OTHER *(Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Item III-C.)*	T04	GALLONS PER DAY OR LITERS PER DAY

UNIT OF MEASURE	UNIT OF MEASURE CODE
GALLONS	G
LITERS	L
CUBIC YARDS	Y
CUBIC METERS	C
GALLONS PER DAY	U
LITERS PER DAY	V
TONS PER HOUR	D
METRIC TONS PER HOUR	W
GALLONS PER HOUR	E
LITERS PER HOUR	H
ACRE-FEET	A
HECTARE-METER	F
ACRES	B
HECTARES	Q

EXAMPLE FOR COMPLETING ITEM III *(shown in line numbers X-1 and X-2 below)*: A facility has two storage tanks, one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

C DUP 1

LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify)	2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY
X-1	S 0 2	600	G	
X-2	T 0 3	20	E	
1	S 0 1	27,500	G	
2	S 0 2	12,500	G	
3	T 0 3	0.55	D	
4				
5				
6				
7				
8				
9				
10				

Continued from page 2.

NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	T/A	C	FOR OFFICIAL USE ONLY	T/A	C	
W M 0 D 0 0 4 9 5 4 1 1 1		1	W DUP		2	DUP

IV. DESCRIPTION OF HAZARDOUS WASTES *(continued)*

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)				D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	F 0 0 1	10,000	P	S 01				
2	F 0 0 2	175,000	P	S 01				
3	F 0 0 3	50,000	P	S 01				
4	F 0 0 5	10,000	P	S 01				
5	F 0 2 3	35,000	P	S 01				
6	P 0 2 2	100	P	S 01				
7	P 0 2 4	100	P	S 01				
8	P 0 9 8	100	P	S 01				
9	U 0 0 2	100	P	S 01				
10	U 0 0 3	100	P	S 01				
11	U 0 1 2	100	P	S 01				
	U 0 1 9	100	P	S 01				
13	U 0 3 1	100	P	S 01				
14	U 0 3 7	100,000	P	S 01				
15	U 0 4 4	100	P	S 01				
16	U 0 5 2	100	P	S 01				
17	U 0 5 6	100	P	S 01				
18	U 0 6 9	100	P	S 01				
19	U 0 7 0	100	P	S 01				
20	U 0 8 0	5,000	P	S 01				
21	U 0 8 8	100	P	S 01				
22	U 0 9 2	100	P	S 01				
23	U 1 0 2	100	P	S 01				
24	U 1 1 0	100	P	S 01				
	U 1 1 2	100	P	S 01				
26	U 1 1 7	100	P	S 01				

Continued from page 2.
NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	T/A C	FOR OFFICIAL USE ONLY	T/A C	
W M O D O O 4 9 5 4 1 1 1	1	W DUP	2	DUP

IV. DESCRIPTION OF HAZARDOUS WASTES *(continued)*

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	U122	40,000	P	S01	
2	U123	100	P	S01	
3	U127	100	P	S01	
4	U133	100	P	S01	
5	U134	100	P	S01	
6	U135	100	P	S01	
7	U140	100	P	S01	
8	U144	100	P	S01	
9	U147	10,000	P	S01	
10	U151	100	P	S01	
11	U154	100	P	S01	
	U159	100	P	S01	
13	U161	100	P	S01	
14	U165	100	P	S01	
15	U170	100	P	S01	
16	U187	100	P	S01	
17	U188	10,000	P	S01	
18	U190	100	P	S01	
19	U196	100	P	S01	
20	U202	100	P	S01	
21	U209	100	P	S01	
22	U210	100	P	S01	
23	U211	100	P	S01	
24	U213	100	P	S01	
25	U220	5,000	P	S01	
26	U226	100		S01	

Continued from page 2.
NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)		FOR OFFICIAL USE ONLY		
W M 0 D 0 0 4 9 5 4 1 1 1	1	W DUP	2	DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)				D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	U227	100	P	S 01				
2	U228	100	P	S 01				
3	U239	100	P	S 01				
4	D001	50,000	P	S 01				
5	D002	1.5 million	P	S 01	S 02	T 03		
6	D003	1,000	P	S 01				
7	D098	6,000	P	S 01				
8								
9								
10								
11								
(								
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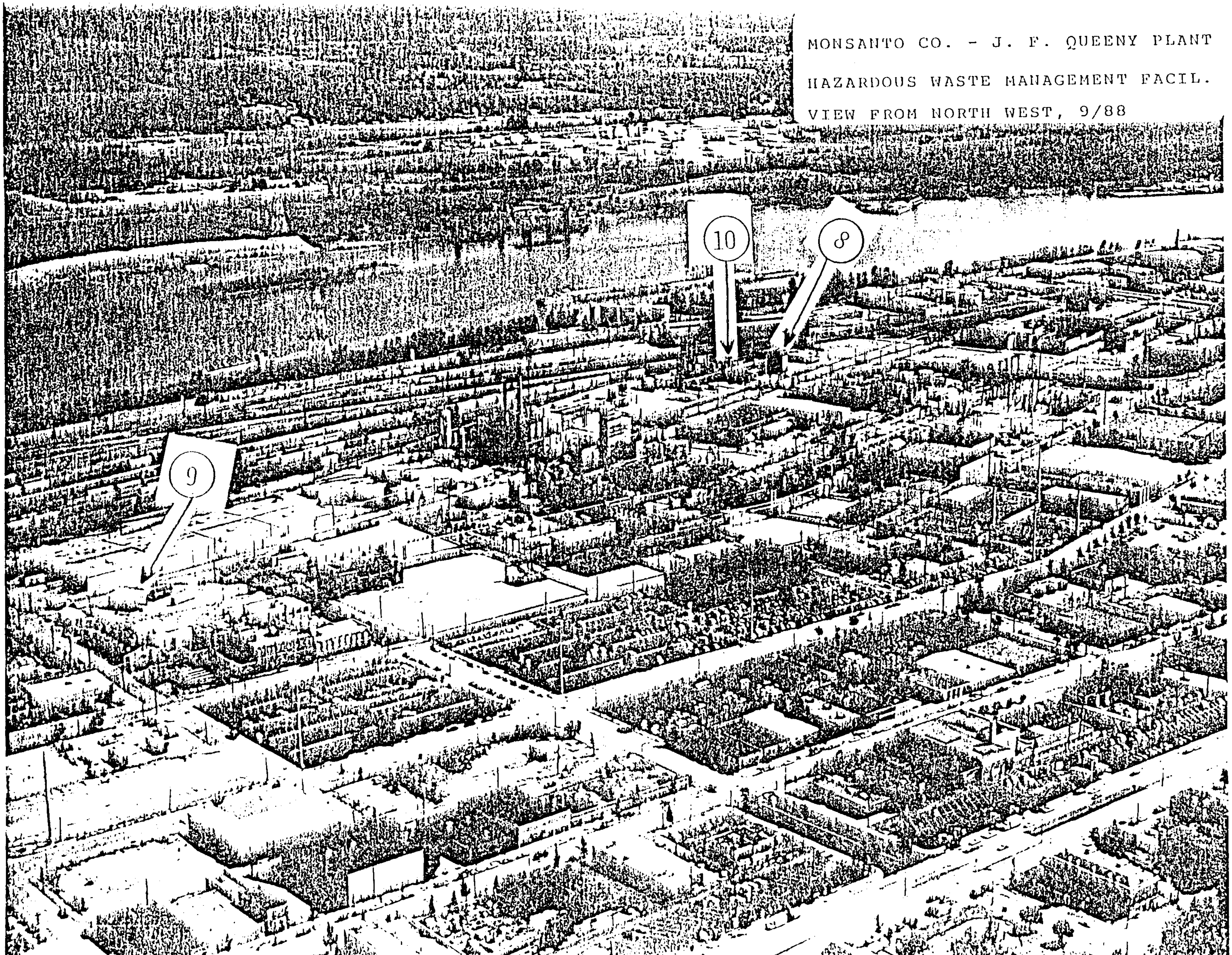
26								

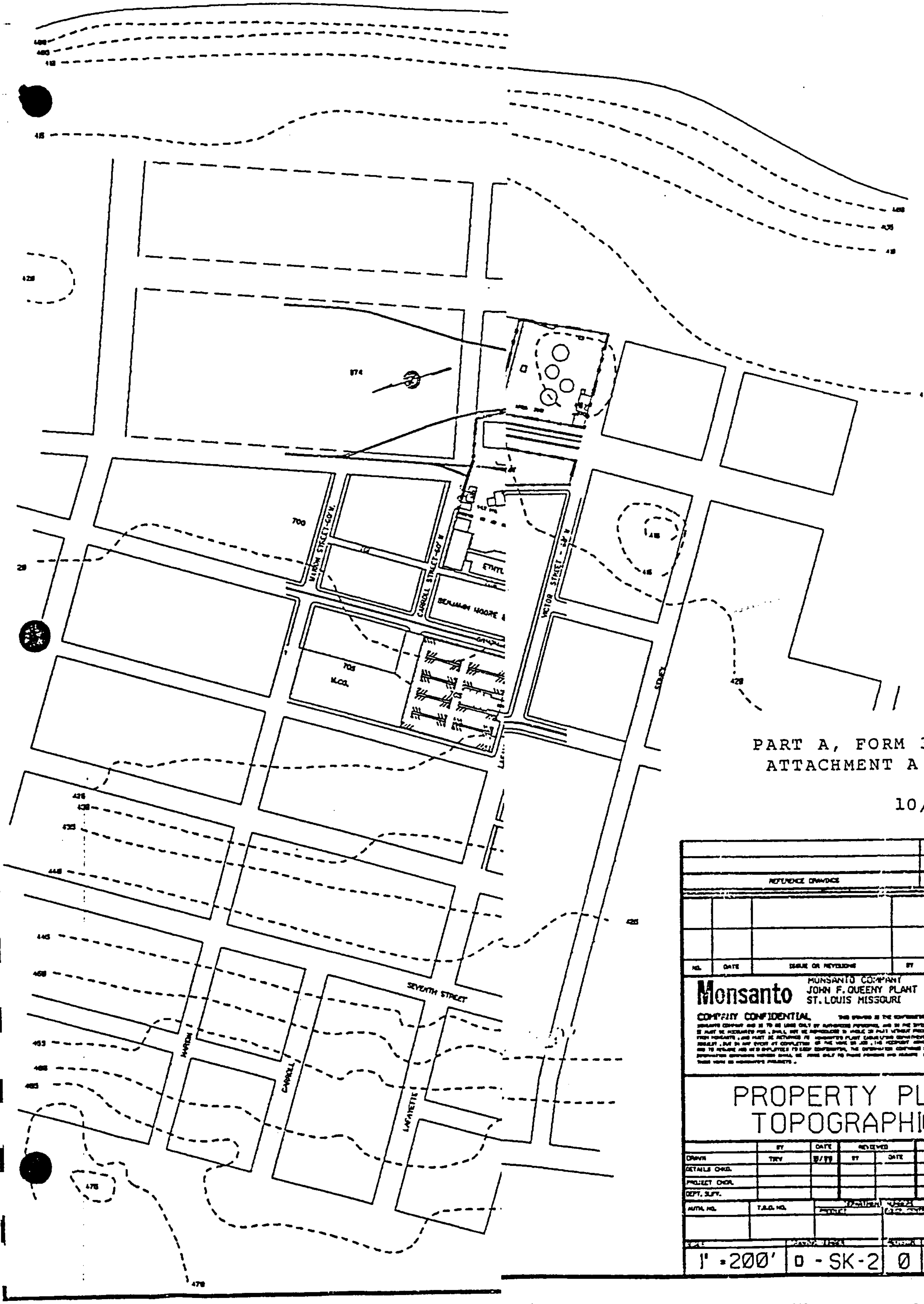

MONSANTO CO. - J. F. QUEENY PLANT
HAZARDOUS WASTE MANAGEMENT FACIL.
VIEW FROM NORTH WEST, 9/88
10
8
9

Continued from page 4.

Form Approved OMB No. 158-S80004

V. FACILITY DRAWING *(see page 4)*

SEE ATTACHMENT A



PART A, FORM 3
ATTACHMENT A

10/14/88

REFERENCE DRAWINGS	DWG. NO.

NO.	DATE	ISSUE OR REVISIONS	BY	CHKD.	APPD.

Monsanto
MONSANTO COMPANY
JOHN F. QUEENY PLANT
ST. LOUIS MISSOURI

COMPANY CONFIDENTIAL

PROPERTY PLAT
TOPOGRAPHIC

	BY	DATE	REVIEWED BY	REVIEWED DATE	REVIEWED BY	REVIEWED DATE
DRAWN	TRV					
DETAILS CHKD.						
PROJECT CHKD.						
DEPT. SUPV.						

1" = 200'	D - SK-2	0	C	CAD

APPENDIX B

GEOLOGIC BOREHOLE LOGS/
WELL CONSTRUCTION DATA

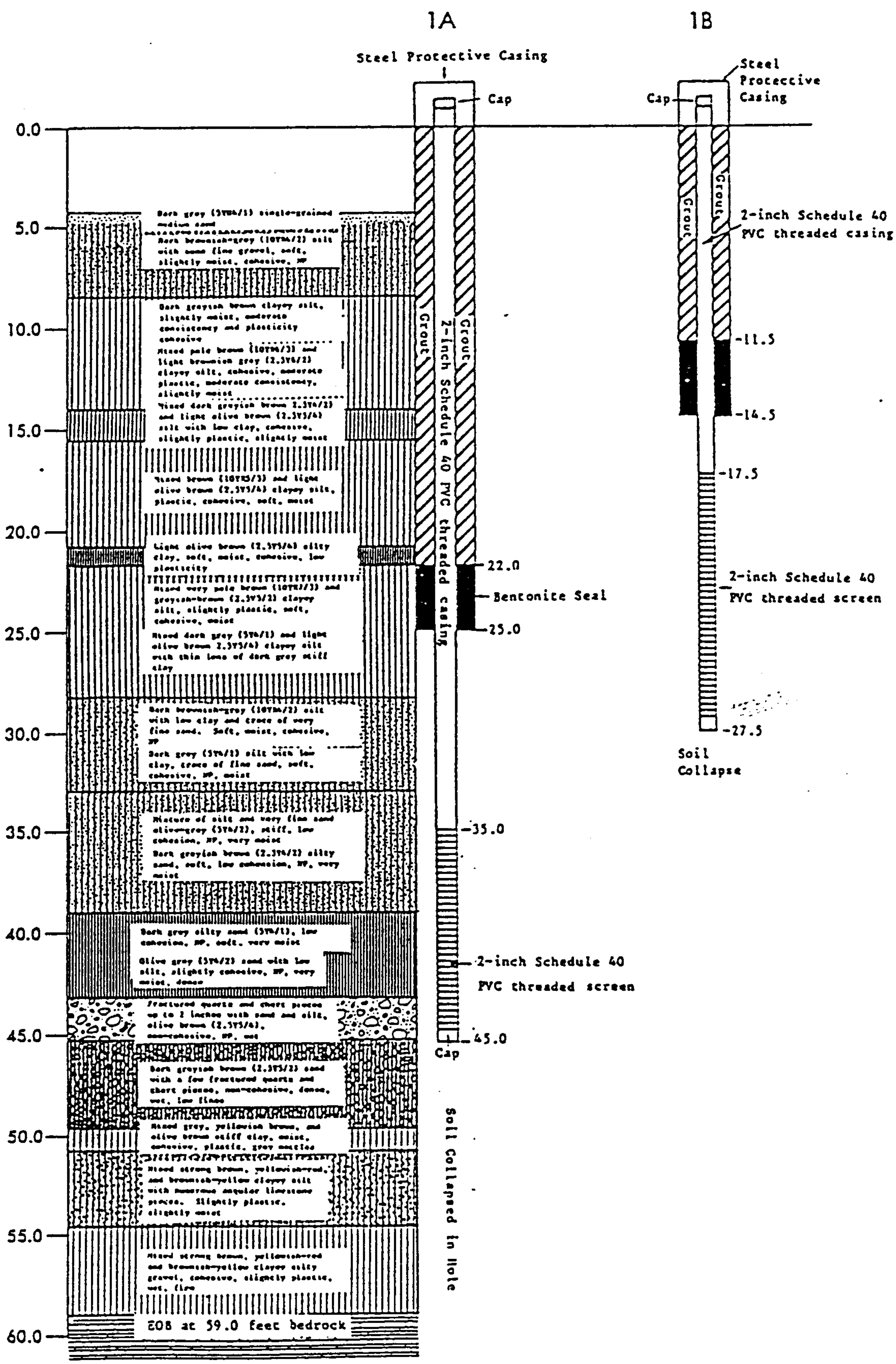
FINAL RCRA FACILITY ASSESSMENT REPORT
MONSANTO-QUEENY PLANT
ST. LOUIS, MISSOURI

Table 1. Summary of Construction Details for Monitoring and Recovery Wells, J.F. Queeny Plant, Monsanto Chemical Company, St. Louis, Missouri.

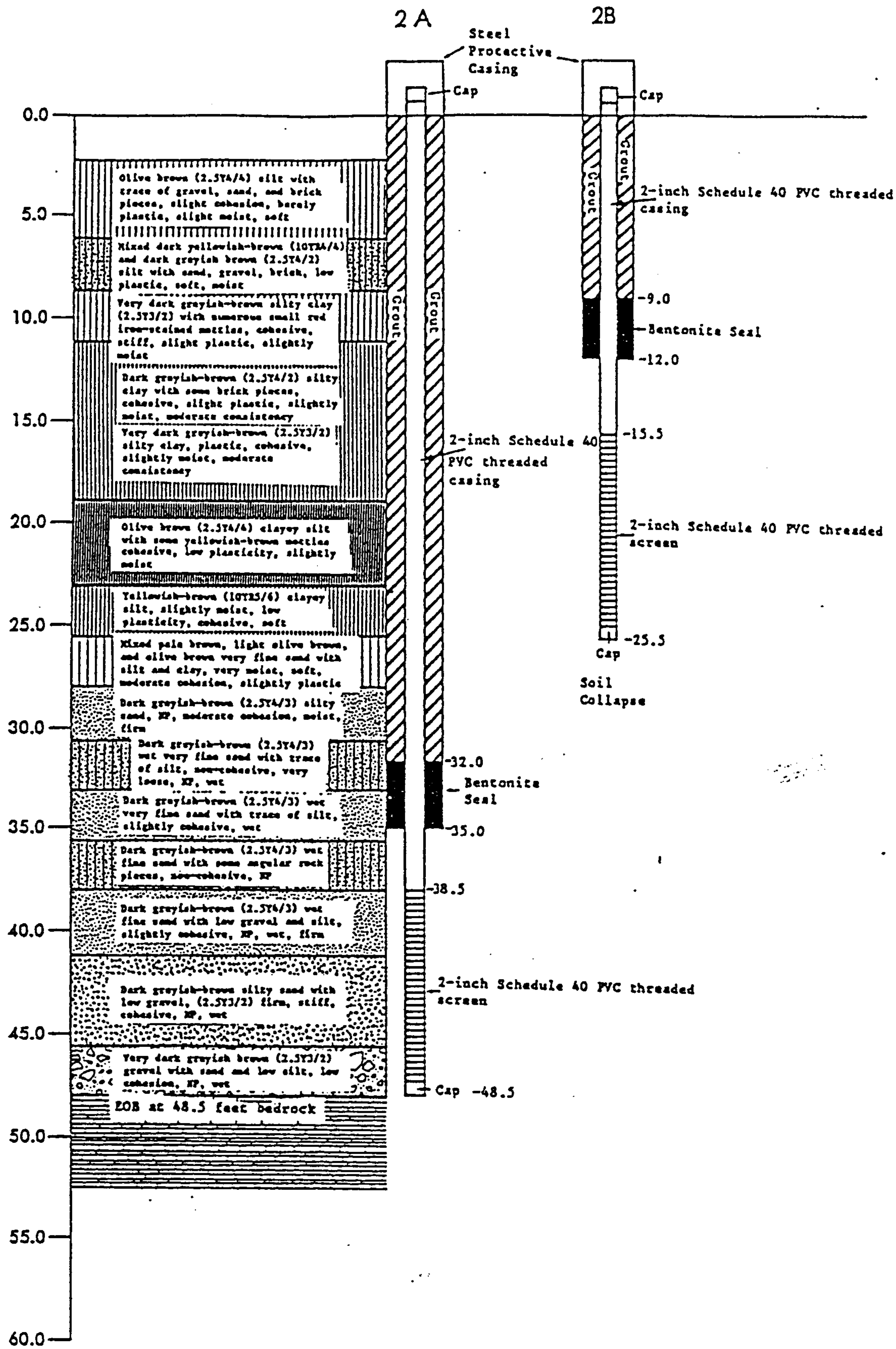
Well Designation	Date Installed	Measuring Point Elevation (1)	Well Diameter (Inches)	Construction Material	Screen Slot Size (Inches)	Total Depth of Well (2)	Screen Setting (3)	Height of Measuring Point Above Land Surface (ft)	Depth To Bedrock (3)
MW1A	10/7/83	430.07	2	PVC	0.02	47	35-45	2.0	59
MW1B	10/6/83	429.82	2	PVC	0.02	30	17.5-27.5	2.5	59
MW2A	10/11/83	430.77	2	PVC	0.02	50	38.5-48.5	1.5	48.5
MW2B	10/10/83	430.70	2	PVC	0.02	27.5	15.5-25.5	2.0	48.5
MW3 (MW-D)	9/30/83	425.41	2	PVC	0.02	33	21-31	2.0	31.5
MW4	9/27/83	427.33	2	PVC	0.02	19	7-17	2.0	17.5
MW5	9/28/83	426.11	2	PVC	0.02	17	5-15	2.0	17
MW6A	9/29/83	426.82	2	PVC	0.02	44.5	32-42	2.5	50
MW6B	11/20/84	426.57	2	PVC	0.02	27.5	10-25	2.5	50
MW7A	10/5/83	422.18	2	PVC	0.02	52	40-50	2.0	95
MW7B	10/6/83	422.54	2	PVC	0.02	33.5	21-31	2.5	95
MW8A	10/27/83	423.70	2	PVC	0.02	49	37-47	2.0	82.5
MW8B	10/27/83	423.67	2	PVC	0.02	35	23-33	2.0	82.5
MW 9	10/13/83	424.92	2	PVC	0.02	43	31-41	2.0	41.5
MW10	10/12/83	425.19	2	PVC	0.02	43.5	31.5-41.5	2.0	41.5
MW11A	10/20/83	426.20	2	PVC	0.02	80	68-78	2.0	--
MW11B	10/20/83	426.35	2	PVC	0.02	32	20-30	2.0	--
MW11C	11/6/84	426.23	2	PVC	0.02	27.5	10-25	2.0	--
MW12	12/11/84	424.03	2	PVC	0.02	21.5	6.5-21.5	0	23
MW13	11/14/84	425.98	2	PVC	0.02	50.5	8-48	2.5	--
MW14	12/10/84	425.92	2	Teflon	0.02	12	5-10	2.0	10
MW15	11/29/84	426.63	2	PVC	0.02	18	10.5-15.5	2.5	16
MW16	12/17/84	421.15	2	PVC	0.02	43.5	8.5-43.5	0	50
MW17	11/26/84	420.52	2	PVC	0.02	52.5	10-50	2.5	--
MW18A	11/30/84	423.17	2	PVC	0.02	81.5	39-79	2.5	81.5
MW18B	12/6/84	423.06	2	PVC	0.02	47.5	10-45	2.5	81.5
MW19	11/19/84	424.11	2	PVC	0.02	15.5	8-13	2.5	13
MW20	11/28/84	423.27	2	PVC	0.02	26.5	9-24	2.5	26.5
MW-A	5/85	---	2	Teflon	0.02	30	20-30	0	31.5
MW-B	5/85	---	2	Teflon	0.02	17	7-17	0	--
MW-C	5/85	---	2	PVC	0.03	20	10-20	0	--
REC-1	1/87	---	4	Stainless Steel	0.01	48	28-48	---	42
REC-2	1/87	---	4	Stainless Steel	0.01	64.5	44.5-64.5	---	58
REC-3	1/87	---	4	Stainless Steel	0.01	66	46-66	---	60
REC-4	1/87	---	4	Stainless Steel	0.01	71	51-71	---	66
GM-1	11/18/86	425.51	2	Stainless Steel	0.01	13.5	6.75-11.75	1.75	11.8
GM-2	11/18/86	425.46	2	Stainless Steel	0.01	11.75	4.75-9.75	2.0	9.8
GM-3	11/19/86	427.48	2	Stainless Steel	0.01	12.5	4.5-9.5	3.0	9.5
GM-4	11/20/86	424.28	2	Stainless Steel	0.01	9.5	5-10	-0.5	9.5
GM-5	11/21/86	424.53	2	Stainless Steel	0.01	16.5	6.5-16.5	-0.5	16.5

(1) Elevation in feet above mean sea level.
(2) Depth in feet below measuring point.
(3) Depth in feet below land surface.
--- Indicates unknown.

All wells installed by ESE except for the following:
REC series wells installed by Brotcke Engineering Company.
GM series wells installed by Geraghty and Miller, Inc.



MONITOR WELL CLUSTER 1	HYDROGEOLOGIC INVESTIGATION	ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.



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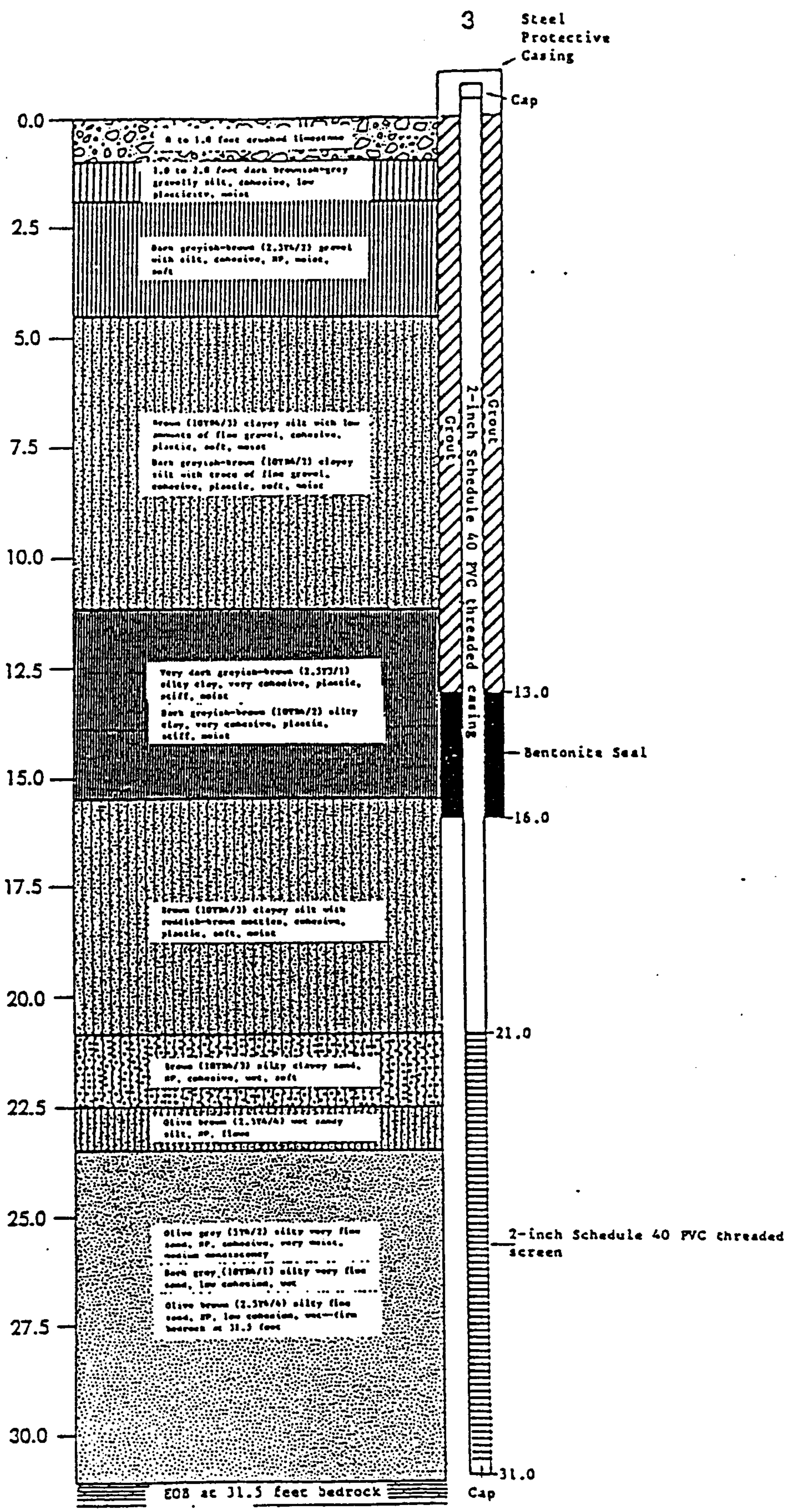
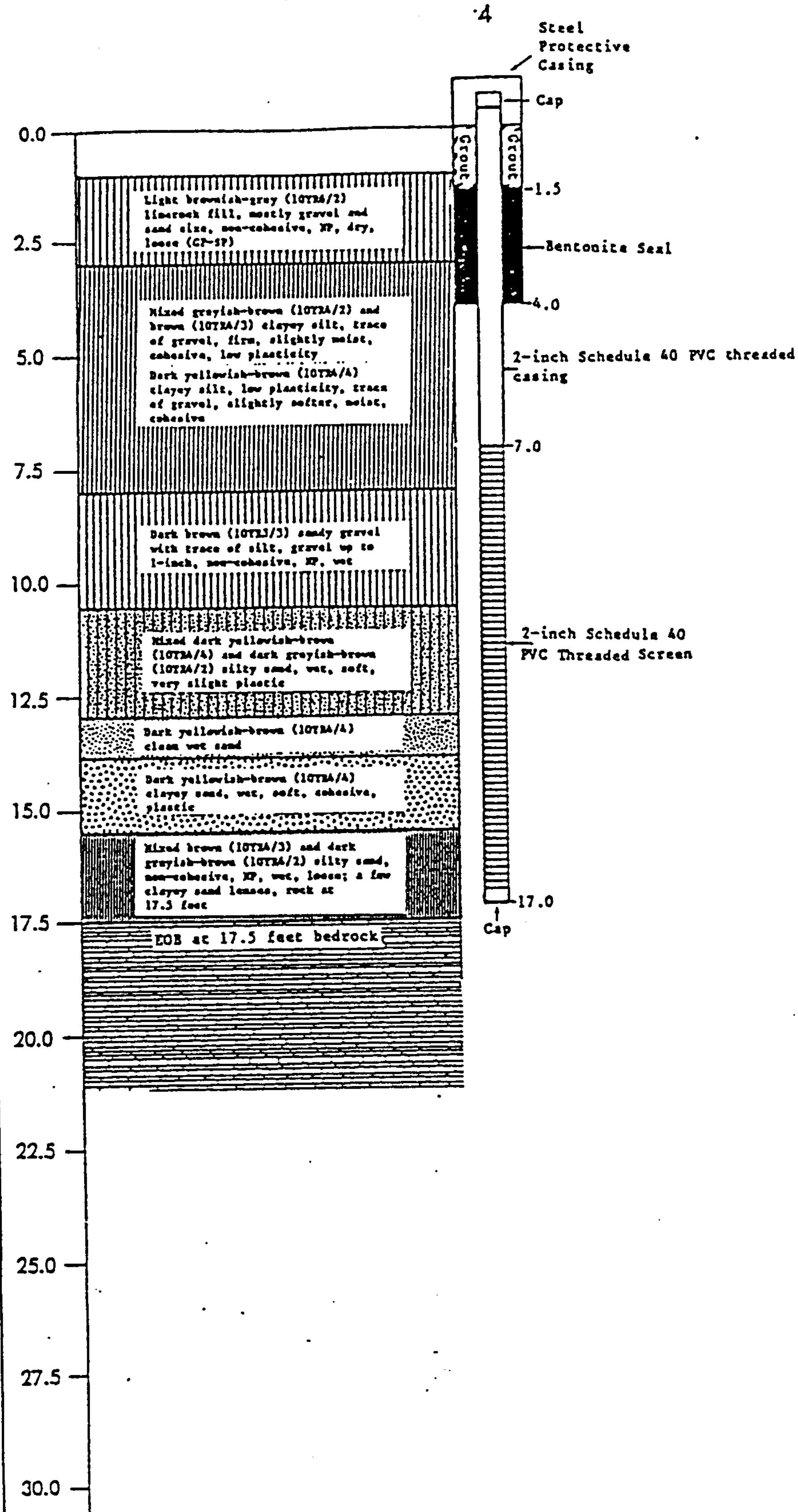
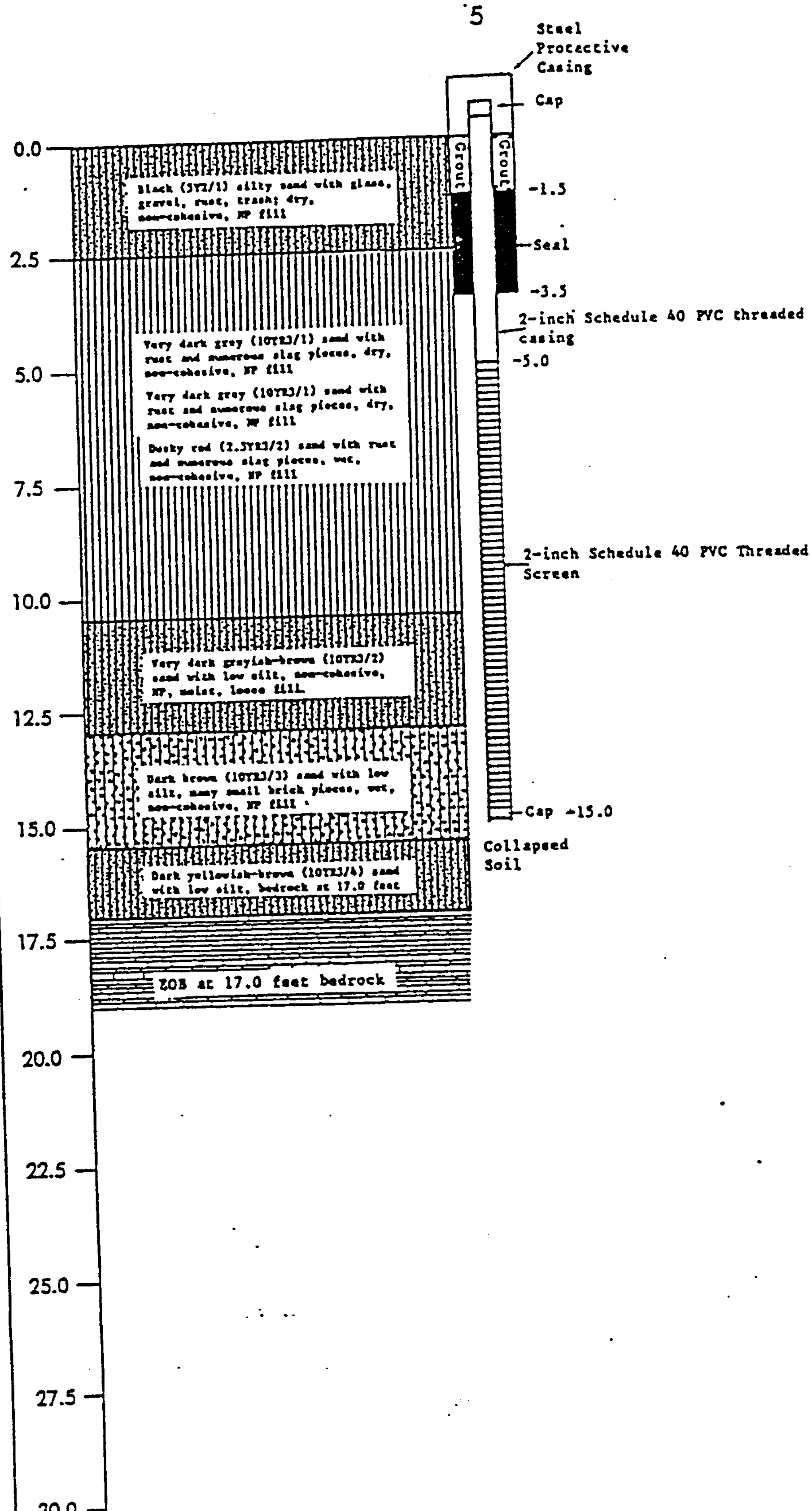


MONITOR WELL 3	HYDROGEOLOGIC INVESTIGATION	ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

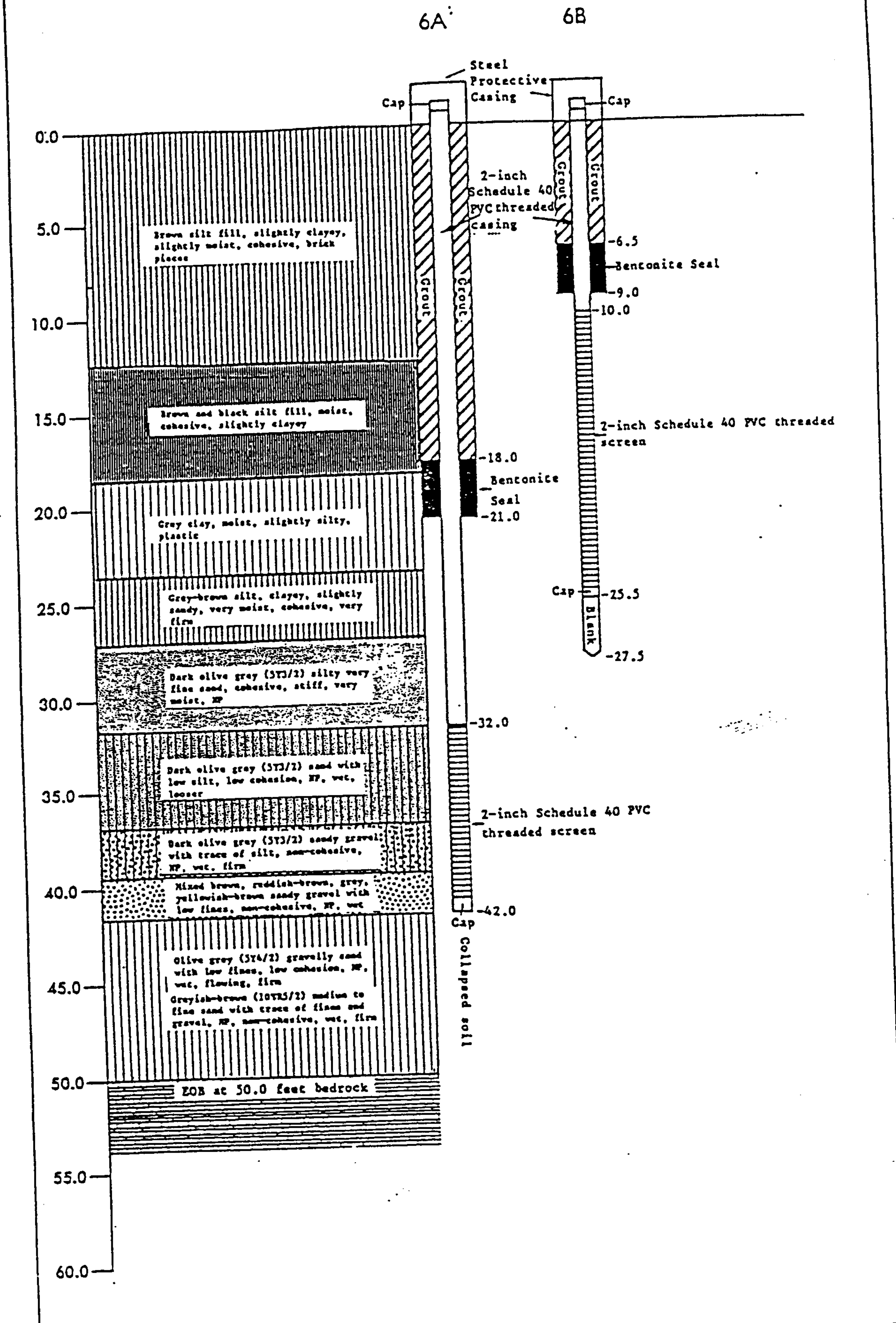


MONITOR WELL 4	HYDROGEOLOGIC INVESTIGATION	ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

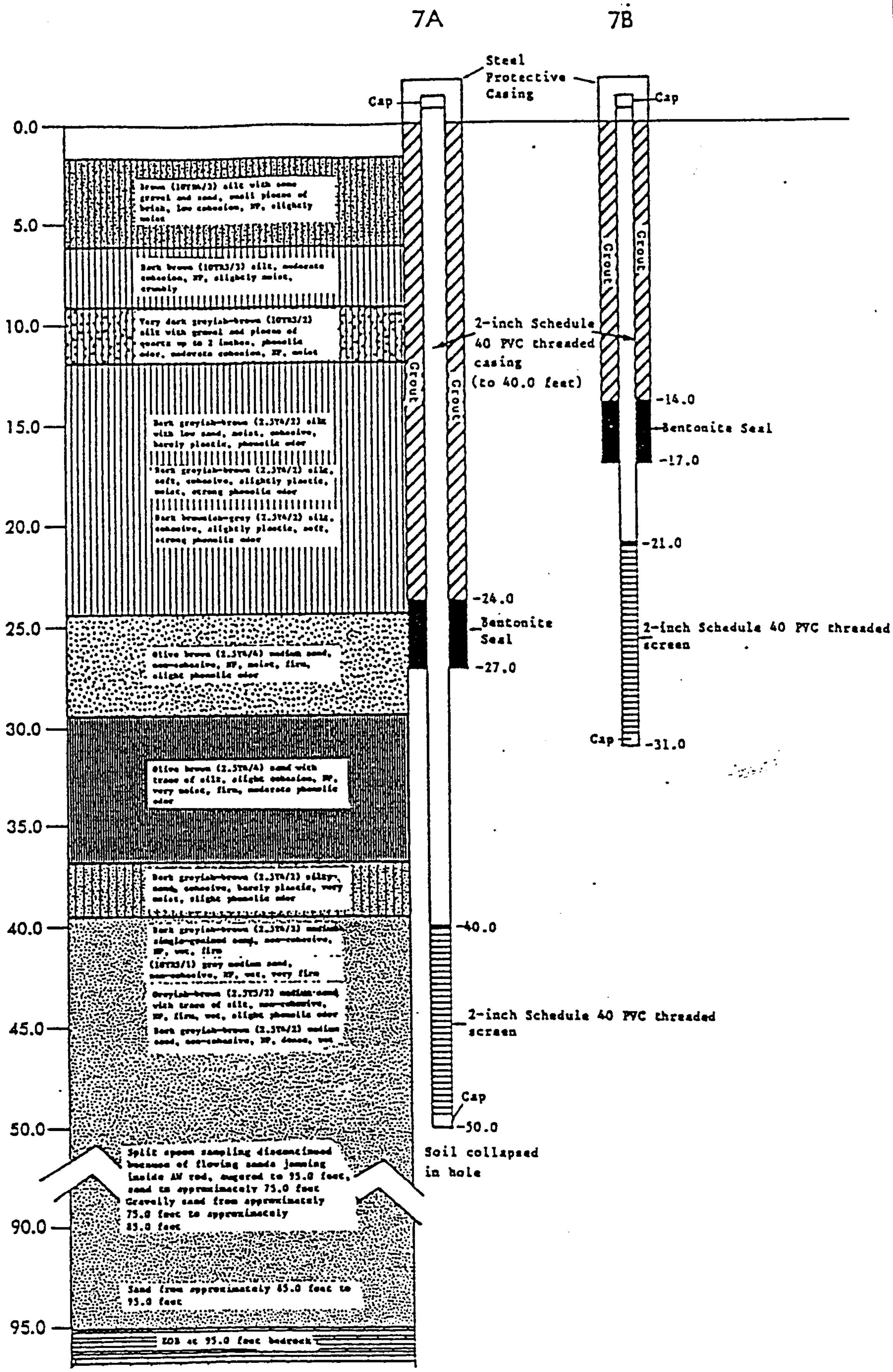
5



MONITOR WELL 5	HYDROGEOLOGIC INVESTIGATION	ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.



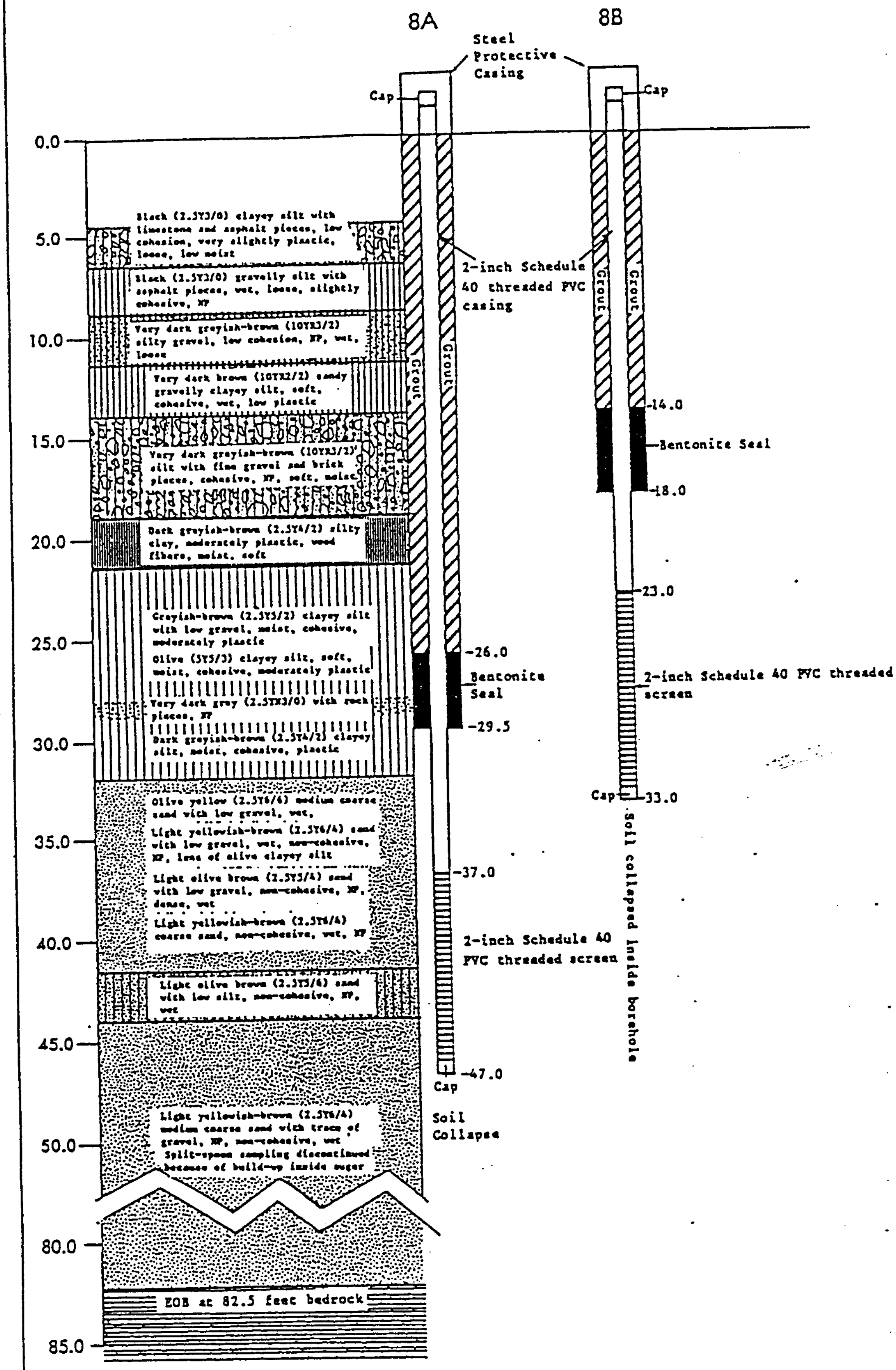
MONITOR WELL CLUSTER 6	HYDROGEOLOGIC INVESTIGATION	ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.



MONITOR WELL CLUSTER 7

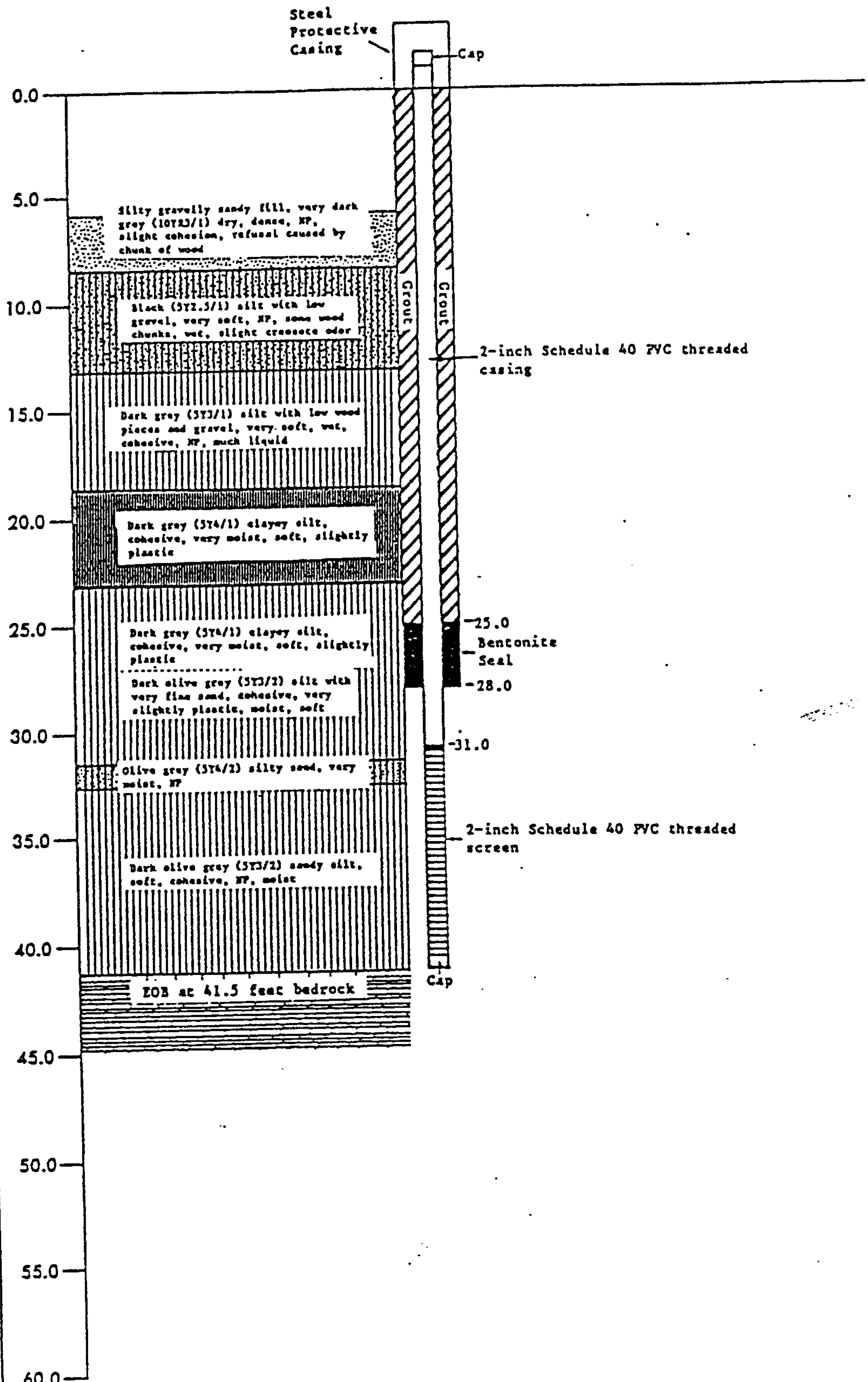
HYDROGEOLOGIC INVESTIGATION

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

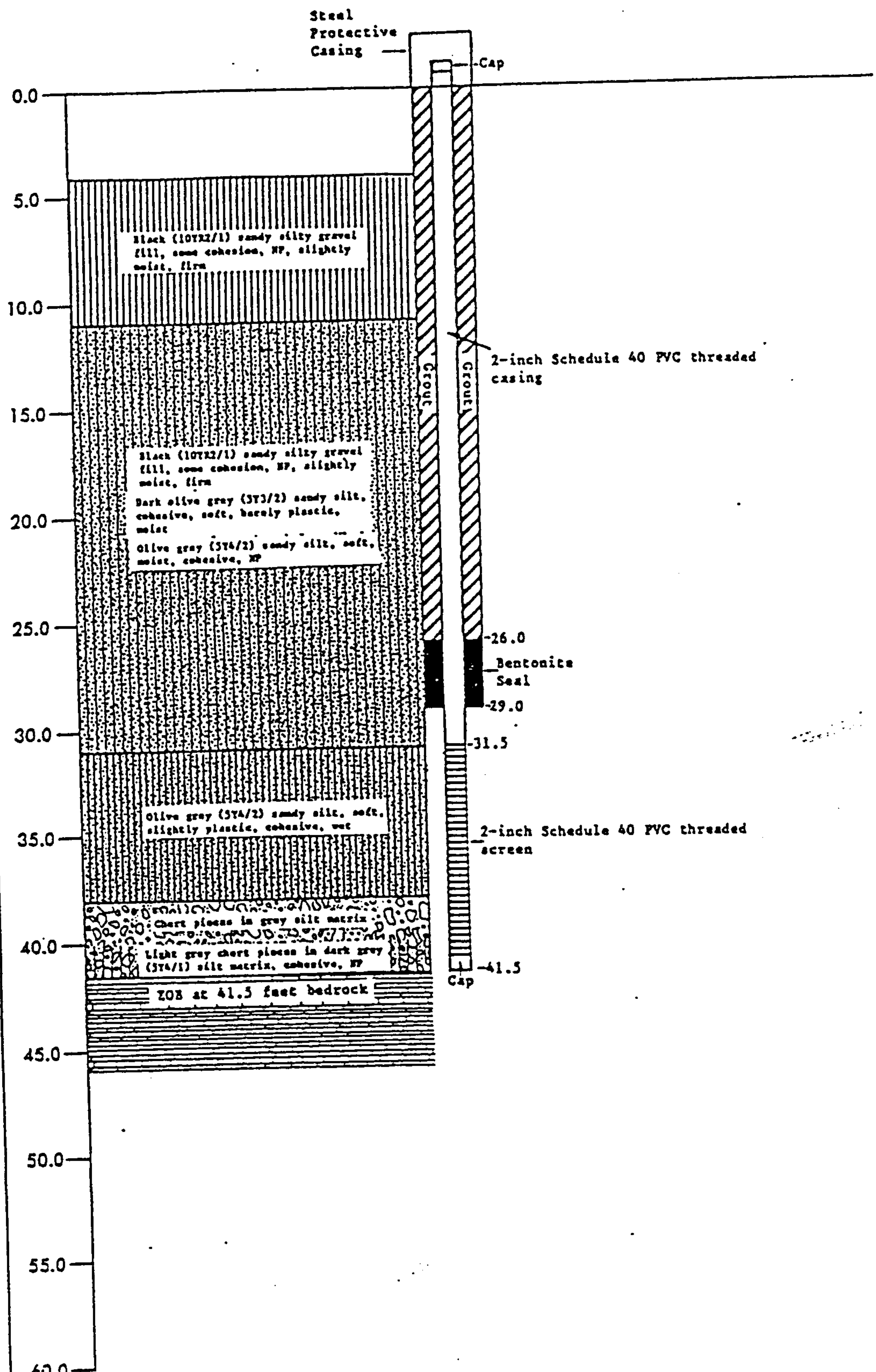


MONITOR WELL CLUSTER 8	HYDROGEOLOGIC INVESTIGATION	ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

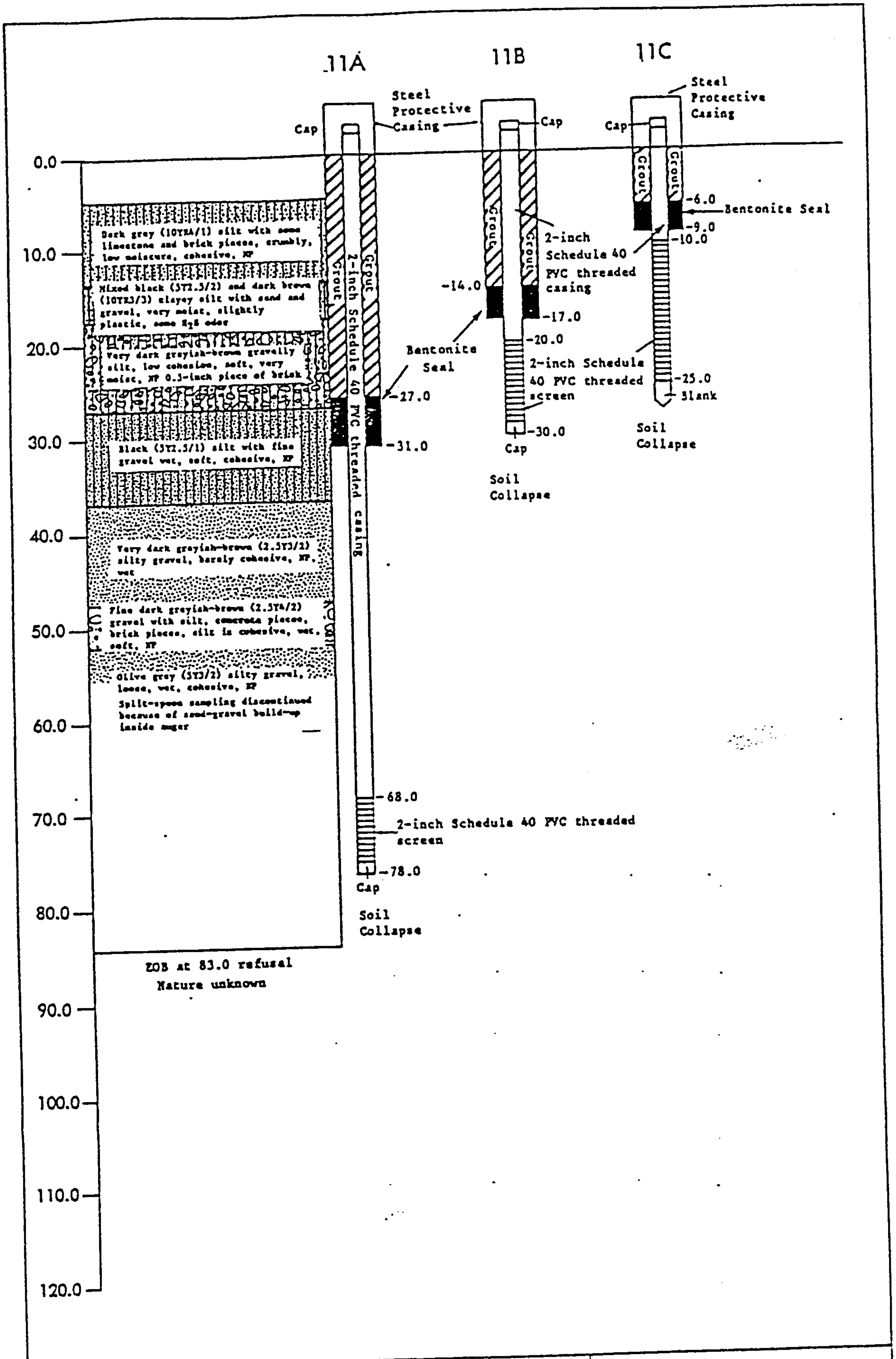
9



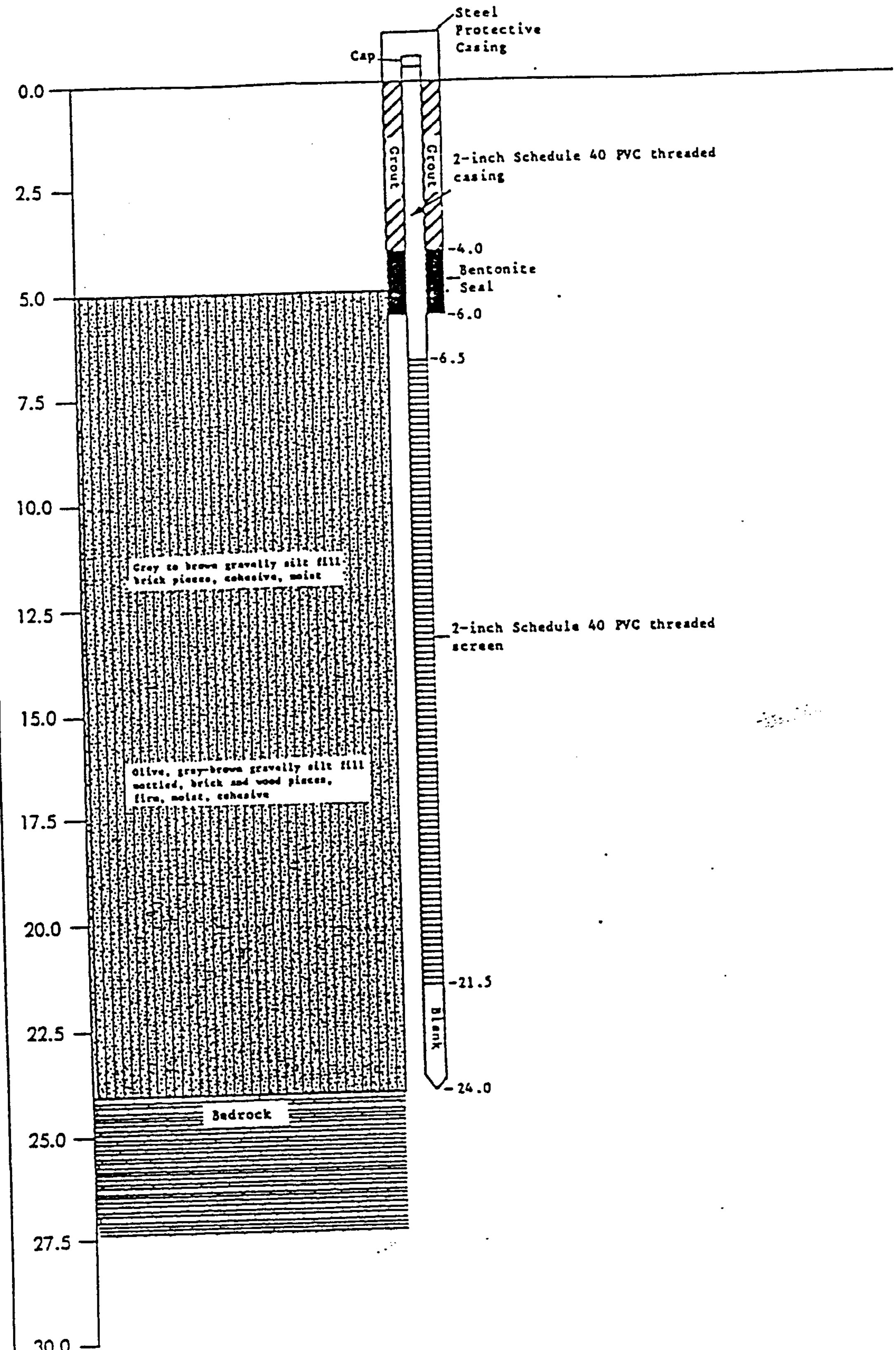
MONITOR WELL 9	HYDROGEOLOGIC INVESTIGATION	ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.



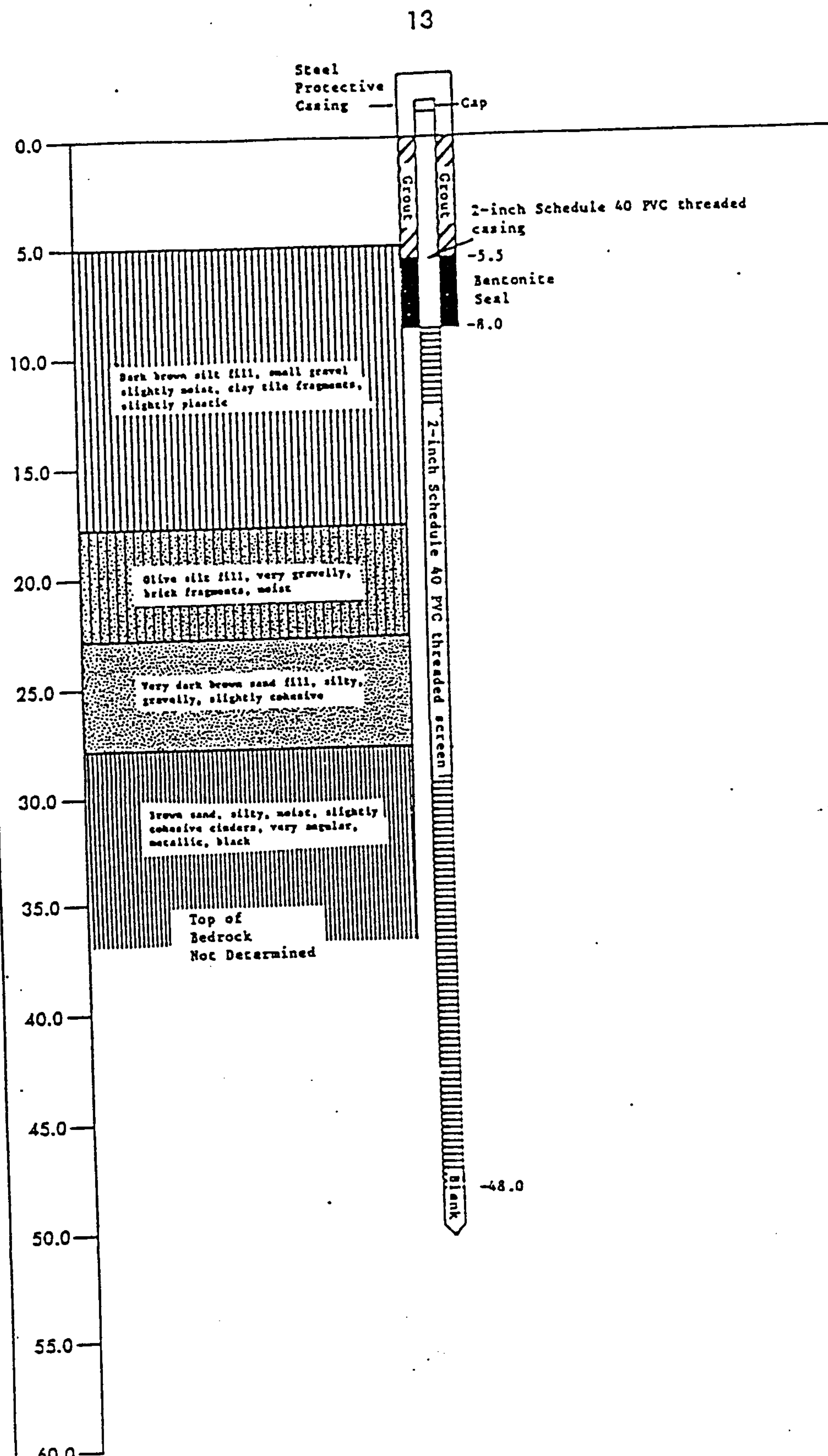
MONITOR WELL 10	HYDROGEOLOGIC INVESTIGATION	ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.



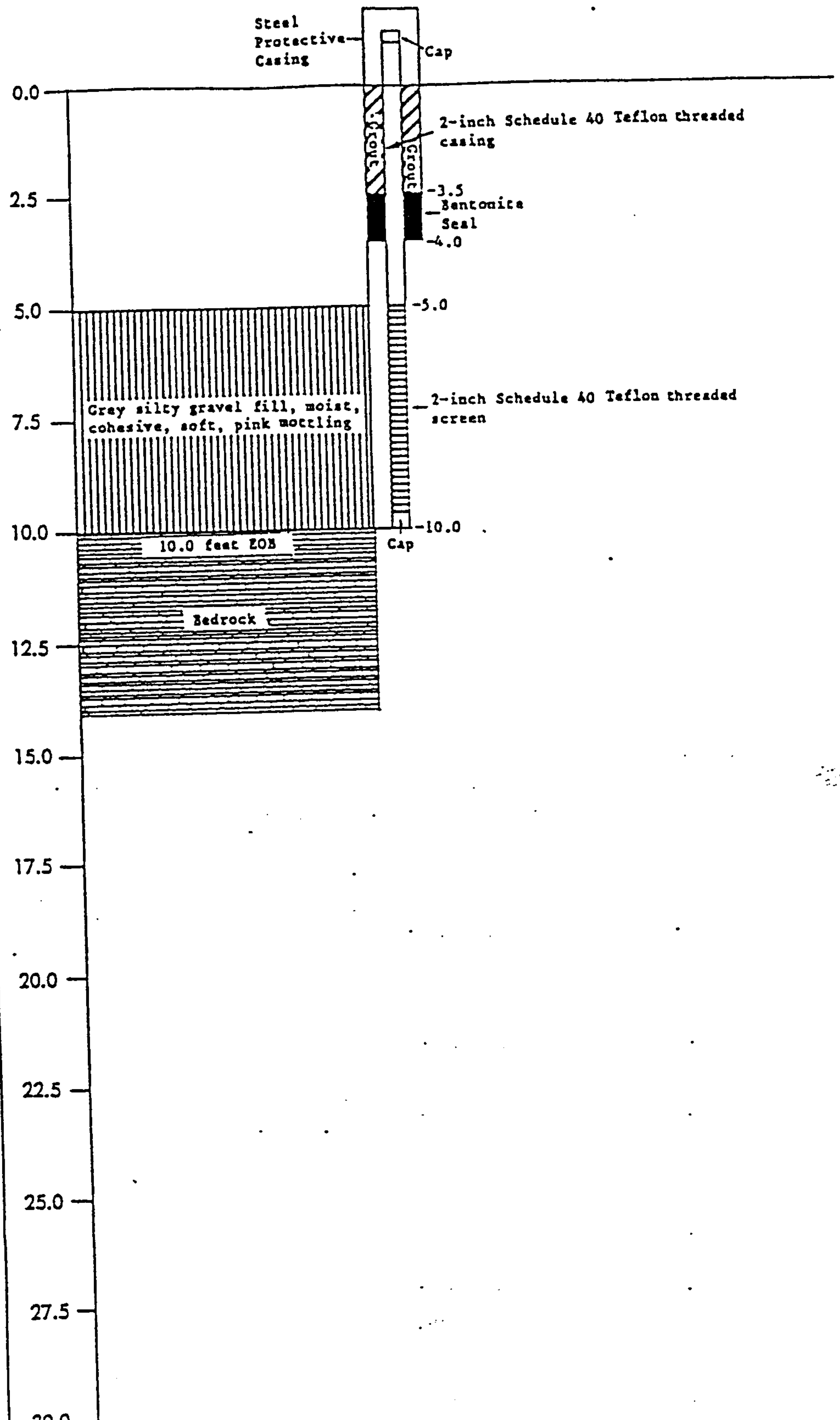
MONITOR WELL CLUSTER 11	HYDROGEOLOGIC INVESTIGATION	ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.



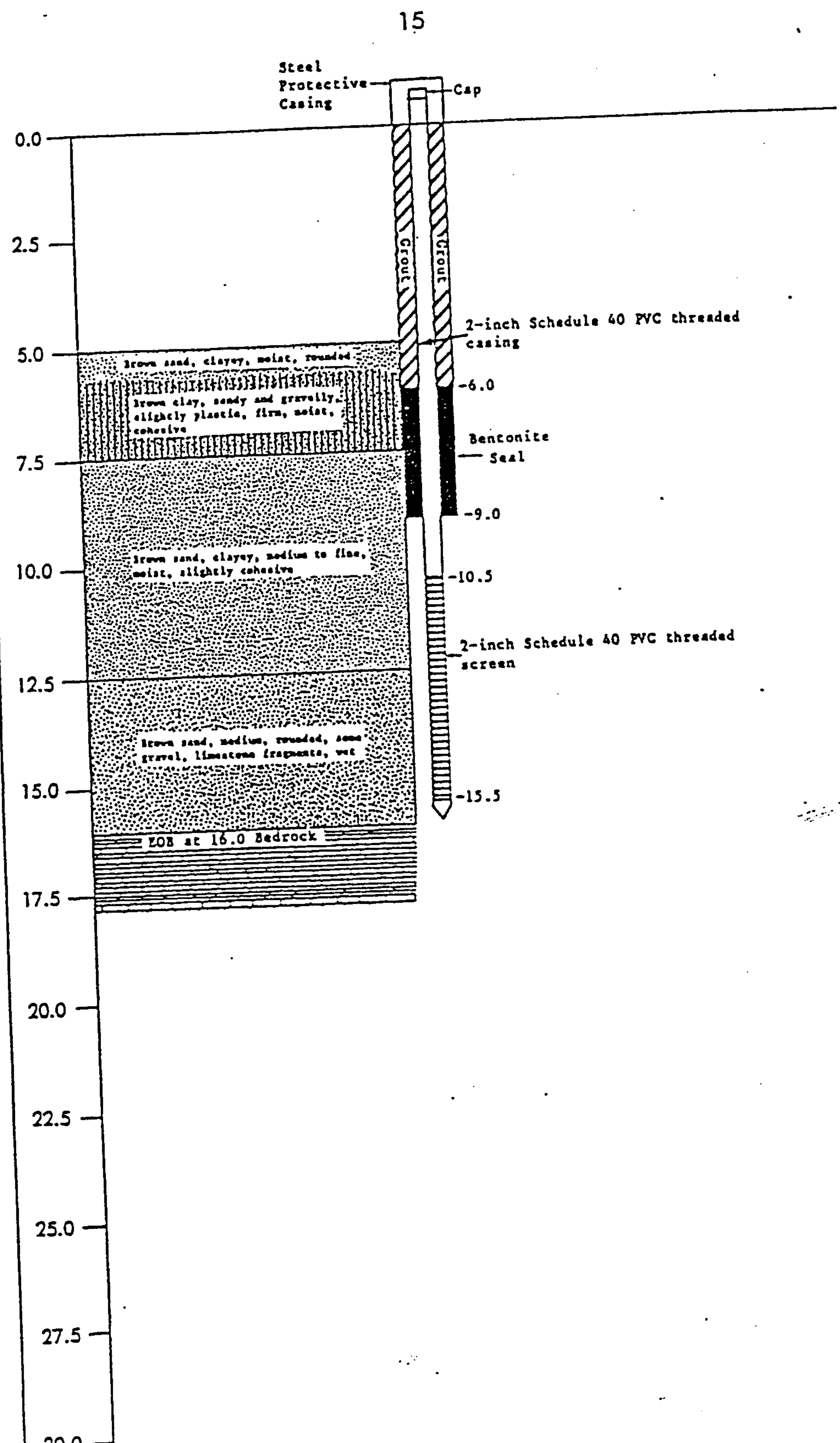
MONITOR WELL 12	HYDROGEOLOGIC INVESTIGATION	ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.



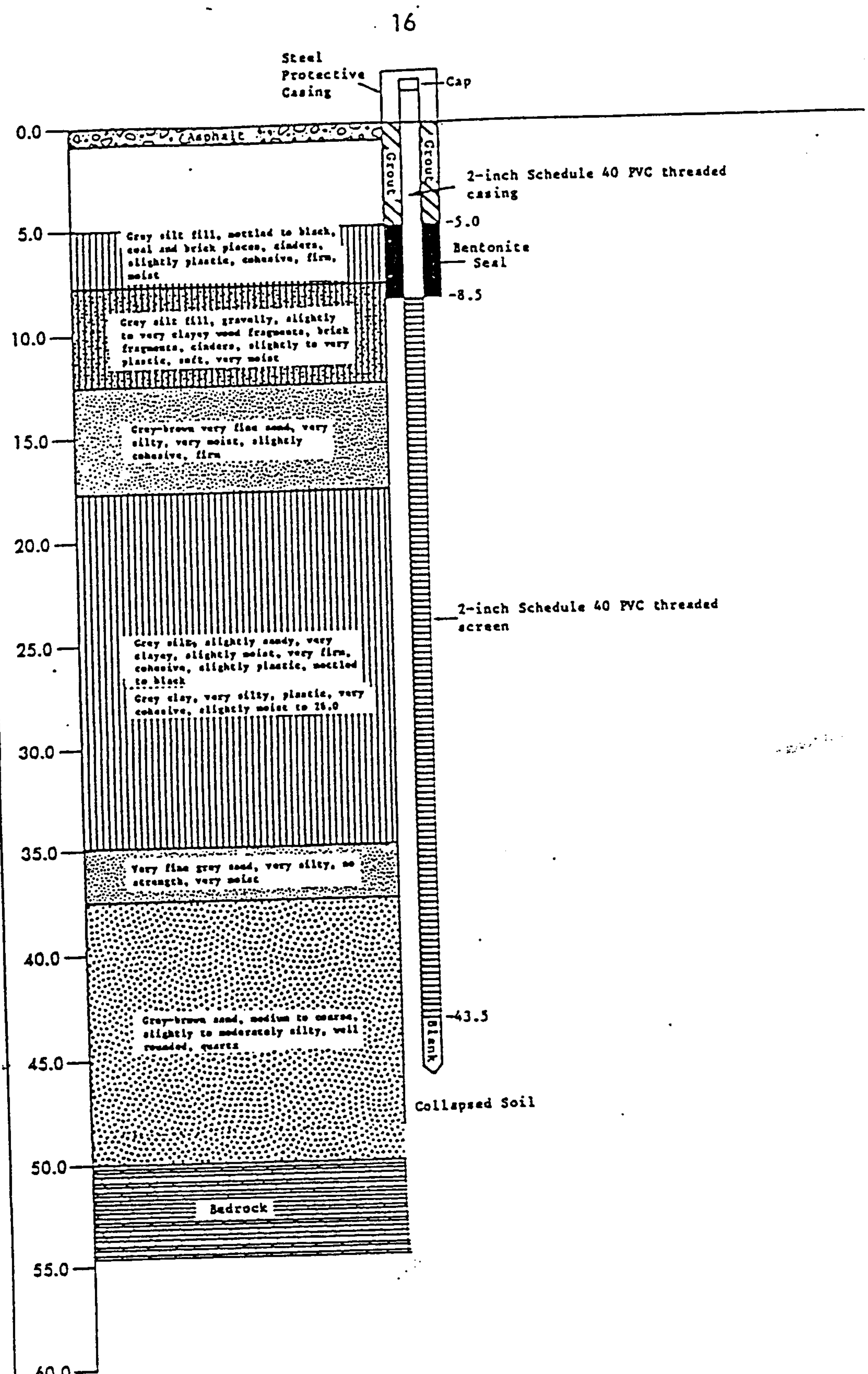
MONITOR WELL 13	HYDROGEOLOGIC INVESTIGATION	ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.



MONITOR WELL 14	HYDROGEOLOGIC INVESTIGATION	ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

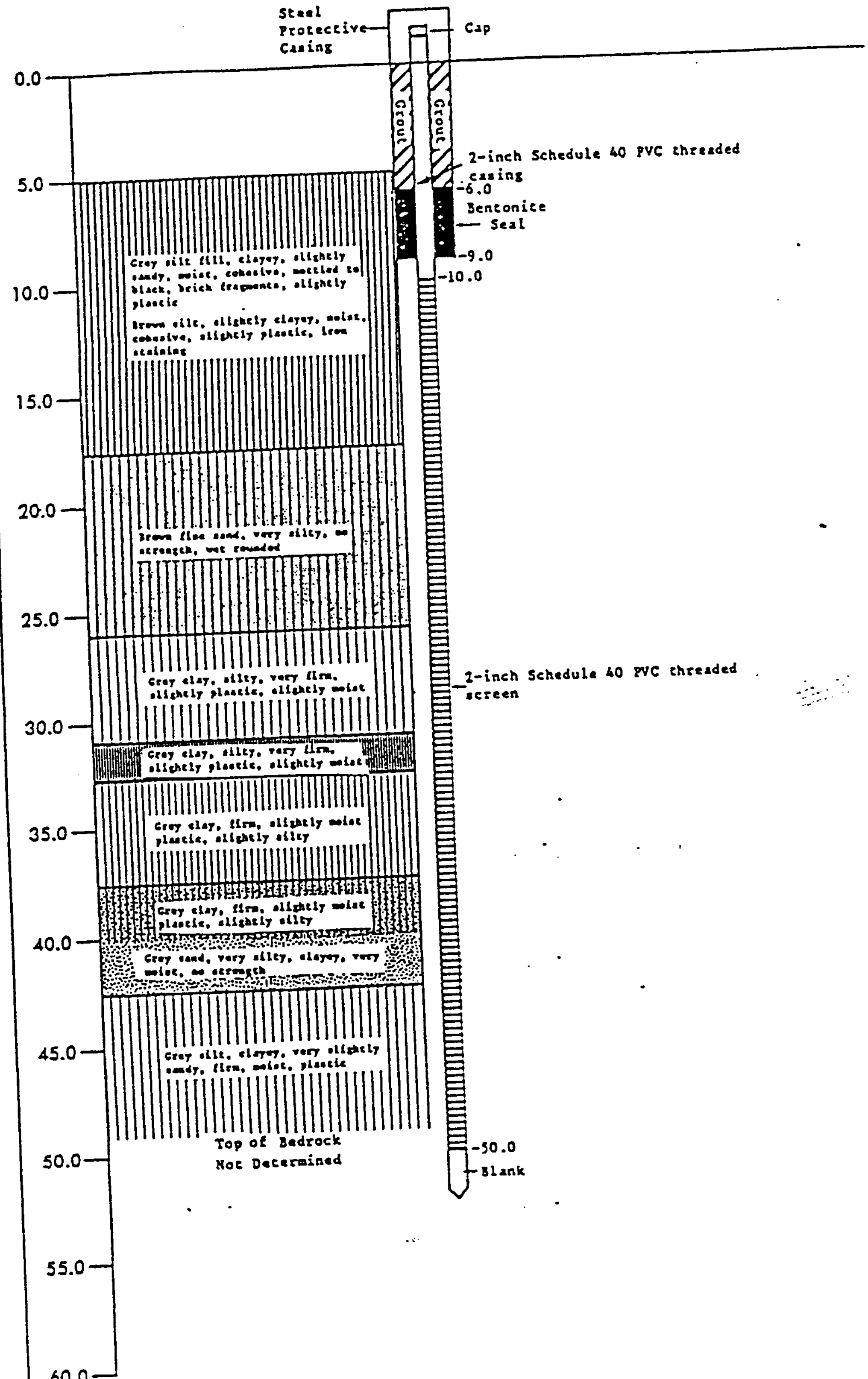


MONITOR WELL 15	HYDROGEOLOGIC INVESTIGATION	ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

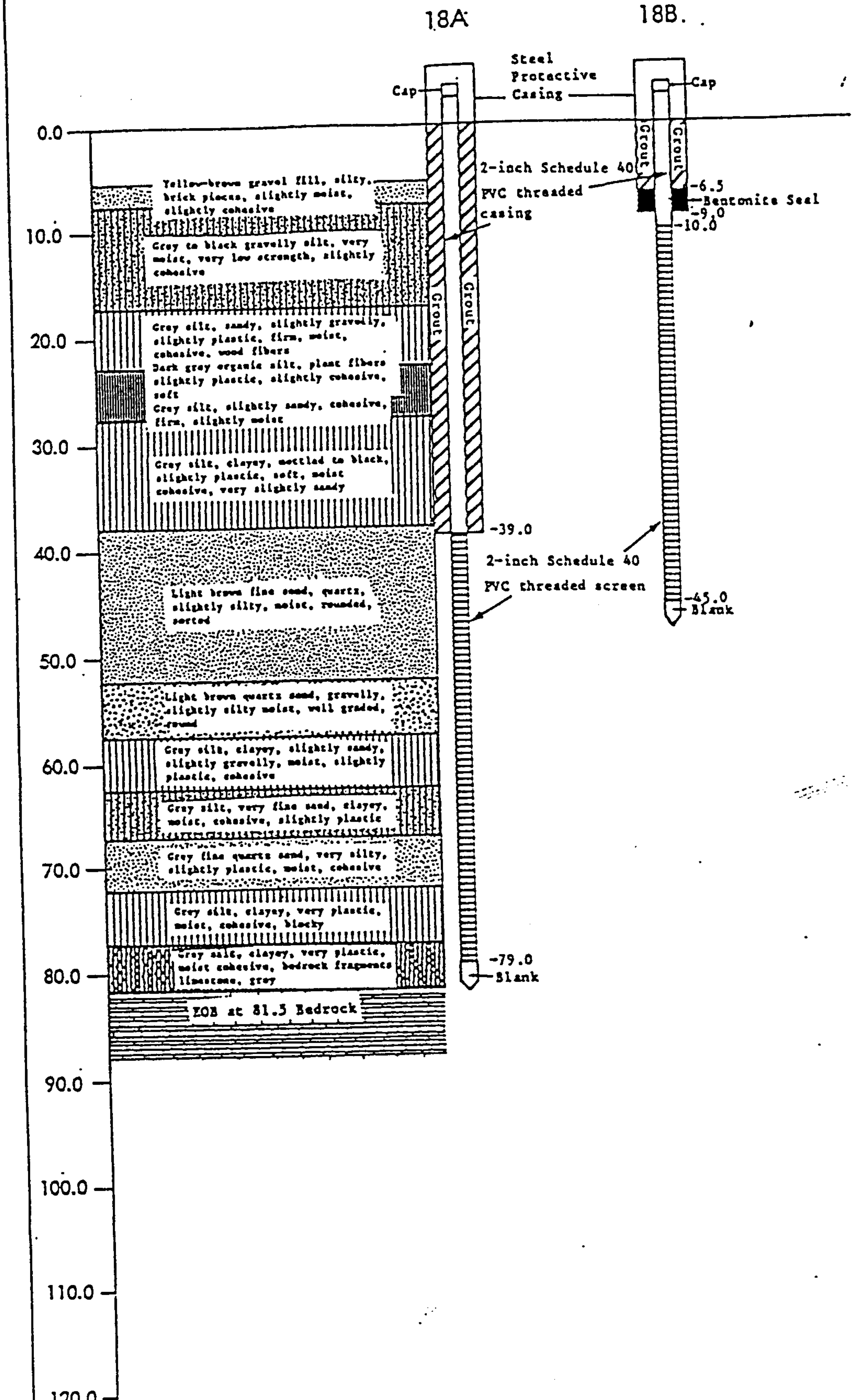


MONITOR WELL 16	HYDROGEOLOGIC INVESTIGATION	ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

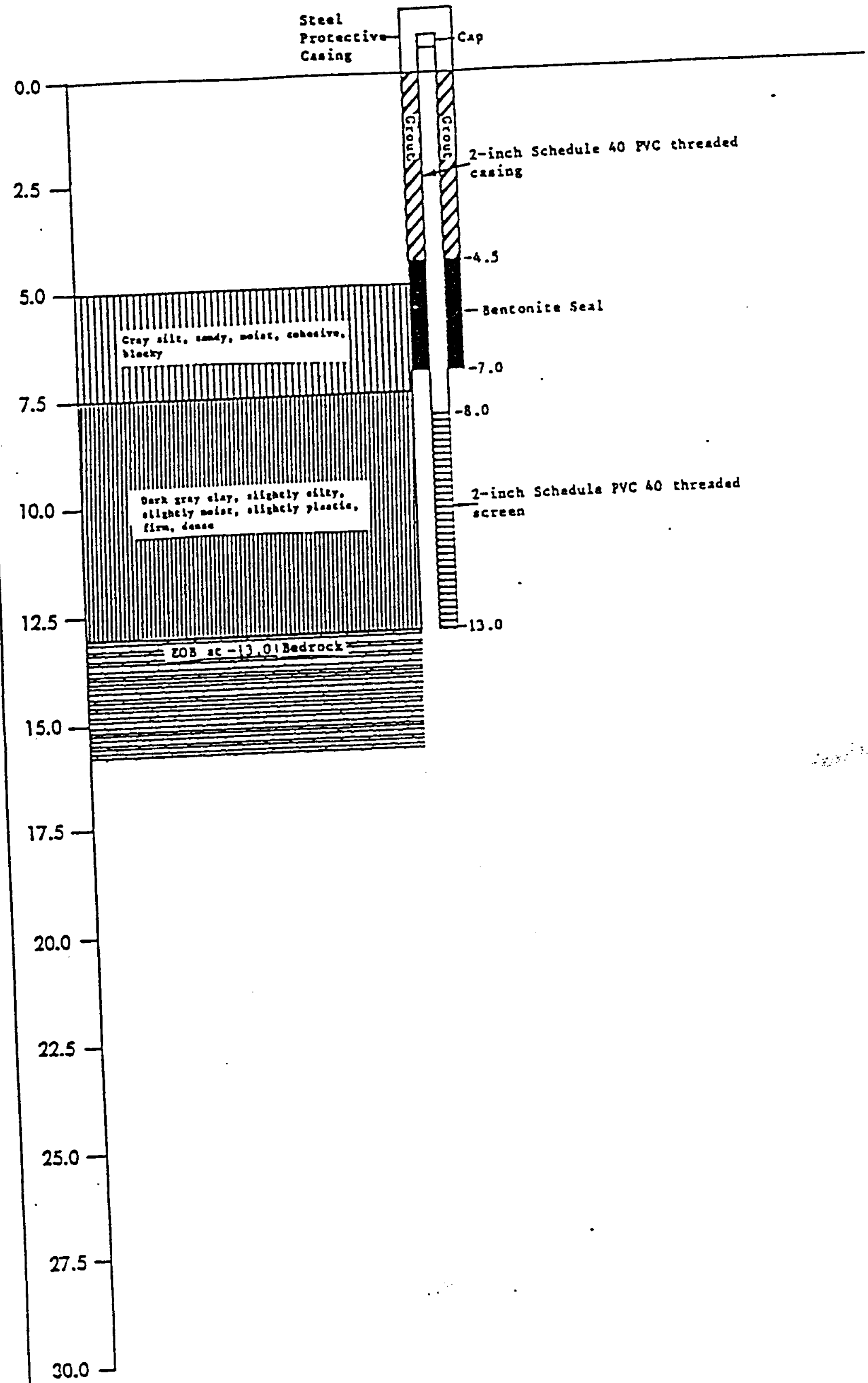
17



MONITOR WELL 17	HYDROGEOLOGIC INVESTIGATION	ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

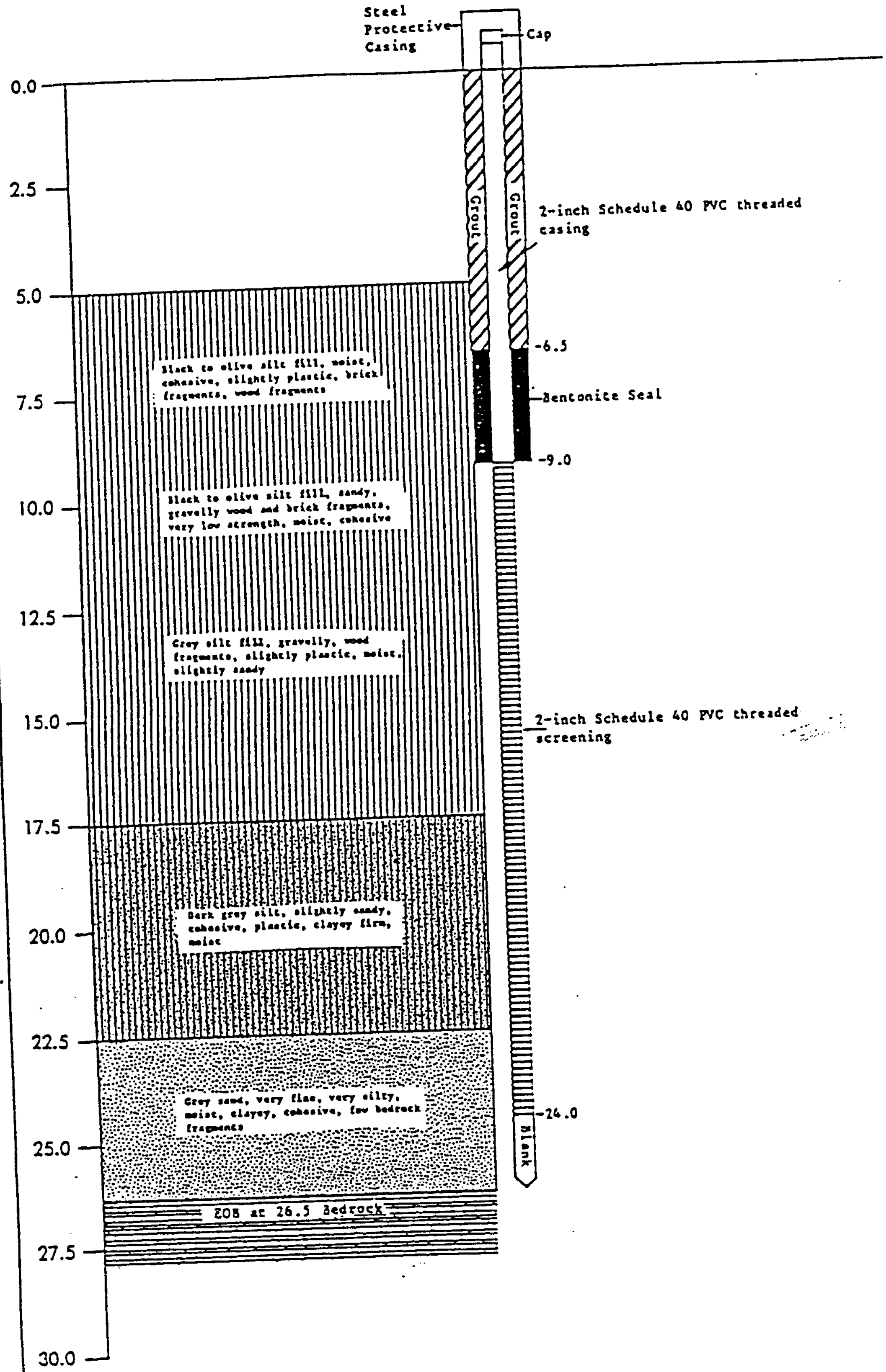


MONITOR WELL CLUSTER 18	HYDROGEOLOGIC INVESTIGATION	ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.



MONITOR WELL 19	HYDROGEOLOGIC INVESTIGATION	ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

20



MONITOR WELL 20	HYDROGEOLOGIC INVESTIGATION	ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

BORING NUMBER SB-A   CLIENT MONSANTO

DATE DRILLED 5-6-85   PROJECT QUEENY - SUBSURFACE INVESTIGATION

ELEVATION ______   GEOLOGIST KEN MEYER

SAMPLE INTERVAL	SAMPLE # AND TYPE	BLOWS PER 6 INCHES	DESCRIPTION AND REMARKS	DEPTH, FT.	USCS SYMBOL AND INTERVAL	WELL SKETCH
	SS-A1	1 5 5 15"	GRAY CLAY FILL, BRICK PIECES, GRAVEL SL. MOIST, CRUMBLY		CL	
	SS-A2	1 2 4 15"	GRAY CLAY, FIRM TO V. FIRM, SL. MOTTLED COHESIVE, V. SL. PLASTIC, MOD. MOIST		CL	
	SS-A3	1 4 5 18"	GRAY CLAY, MOTTLED, V. FIRM, HARD SL. MOIST, SL. SILTY NON PLASTIC COHESIVE		CL	
	SS-A4	1 3 4 18"	GRAY SILTY CLAY, FIRM, HARD, MOD. MOIST, COHESIVE, MOTTLED SL. PLASTIC		CL	
	SS-A5	1 2 2 18"	GRAY CLAY, MOD SILTY, MEDIUM SOFT, MOD. TO SL. PLASTIC, MOTTLED TO BLACK COHESIVE		CL-CH	

METHOD OF DRILLING Hollow-Stem Auger   WELL DIAMETER ______

HOLE DIAMETER 7"   WELL MATERIAL ______

COMPLETION DEPTH ______   WELL DEVELOPMENT ______

WATER LEVEL ≈13'   WATER LEVEL INITIAL ______ FINAL ______

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

BORING NUMBER SB-8

CLIENT Monsanto

DATE DRILLED 5-7-85

PROJECT Queeny - Subsurface Investigation

ELEVATION

GEOLOGIST Ken Meyer

SAMPLE INTERVAL	SAMPLE # AND TYPE	BLOWS PER 6 INCHES	DESCRIPTION AND REMARKS	DEPTH, FT.	USCS SYMBOL AND INTERVAL	WELL SKETCH
	SB-B1	1 1 3 15"	GRAY-BROWN CLAY, SL. SILTY, SL. PLASTIC SL. MOIST, COHESIVE		CL	
	SB-B2	1 2 4 18"	GRAY MOTTLED CLAY, SL SILTY, SL. TO MOD. PLASTIC, SL MOIST, COHESIVE, FIRM		CL	
	SB-B3	1 3 5 18"	GRAY CLAY, AS ABOVE TO 8.0' BROWN CLAY, FIRM, SL SILTY, SL. MOIST COHESIVE NON PLASTIC		CL	
	SB-B4	1 2 3 18"	BROWN CLAY, MOTTLED, FIRM, STIFF SL. MOIST, COHESIVE, SL. SILTY SL PLASTIC		CL	
	SB-B5	1 1 2	MOTTLED GRAY BROWN SILTY CLAY WET - SATURATED, SL. PLASTIC		CL	

METHOD OF DRILLING Hollow Stem Auger

HOLE DIAMETER 7"

COMPLETION DEPTH

WATER LEVEL

WELL DIAMETER

WELL MATERIAL

WELL DEVELOPMENT

WATER LEVEL INITIAL FINAL

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

BORING NUMBER SB-C
CLIENT MONSANTO
DATE DRILLED 5-7-85
PROJECT QUEENY - SUBSURFACE INVESTIGATION
ELEVATION
GEOLOGIST KEN MEYER

DEPTH, FT.	SAMPLE INTERVAL	SAMPLE # AND TYPE	BLOWS PER 6 INCHES	DESCRIPTION AND REMARKS	DEPTH, FT.	USCS SYMBOL AND INTERVAL	WELL SKETCH
0.0							
-2.5							
		SB-C1	1 2 3 15"	BROWN CLAY FILL, SL. PLASTIC, SL MOIST, SL. SILTY, COHESIVE		CL	
-5.0		SB-C2	1 2 3 18"	BROWN MOTTLED CLAY, SL MOIST, SL SILTY COHESIVE, SL. PLASTIC, MOD. FIRM		CL	
-7.5		SB-C3	1 2 2 18"	GRAY-BROWN CLAY, SL. MOTTLED, FIRM SL MOIST, SL. PLASTIC, SL. SILTY COHESIVE		CL	
-10.0		SB-C4	1 2 4 18"	GRAY-BROWN MOTTLED CLAY, SILTY, MOIST SL. PLASTIC, COHESIVE		CL	
	▼ S						
-12.5		SB-C5	1 3 3	GRAY SILT, VERY CLAYEY, PLASTIC, COHESIVE SATURATED			
-15.0							

METHOD OF DRILLING Hollow Stem Auger
HOLE DIAMETER 7"
COMPLETION DEPTH
WATER LEVEL 12'
WELL DIAMETER
WELL MATERIAL
WELL DEVELOPMENT
WATER LEVEL INITIAL ____ FINAL ____

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

BORING NUMBER SB-D
CLIENT Monsanto
DATE DRILLED 5-7-85
PROJECT Queeny - Subsurface Investigation
ELEVATION
GEOLOGIST Ken Meyer

DEPTH, FT.	SAMPLE INTERVAL	SAMPLE # AND TYPE	BLOWS PER 6 INCHES	DESCRIPTION AND REMARKS	DEPTH, FT.	USCS SYMBOL AND INTERVAL	WELL SKETCH
0.0							
2.5							
		SB-D1	1 1 3 15"	DARK GRAY CLAY, SL SILTY, FIRM, COHESIVE SL. MOIST, SL PLASTIC		CL	
5.0		SB-D2	1 1 2 18"	DARK GRAY CLAY, SL. SILTY, SL. CRUMBLY, FIRM, SL. MOIST		CL	
7.5		SB-D3	1 1 3 15"	DARK GRAY AS ABOVE TO 8.0 BROWN MOTTLED CLAY, FIRM, SL. MOIST SL PLASTIC, COHESIVE		CL CL	
10.0		SB-D4	1 1 3 16"	BROWN MOTTLED SILTY CLAY, MOIST SL. PLASTIC, COHESIVE		CL	
12.5							

METHOD OF DRILLING Hollow Stem Auger
HOLE DIAMETER 7"
COMPLETION DEPTH
WATER LEVEL 11.5'
WELL DIAMETER
WELL MATERIAL
WELL DEVELOPMENT
WATER LEVEL INITIAL ____ FINAL ____

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

BORING NUMBER SB-E / MWA

DATE DRILLED 5-11-85

ELEVATION

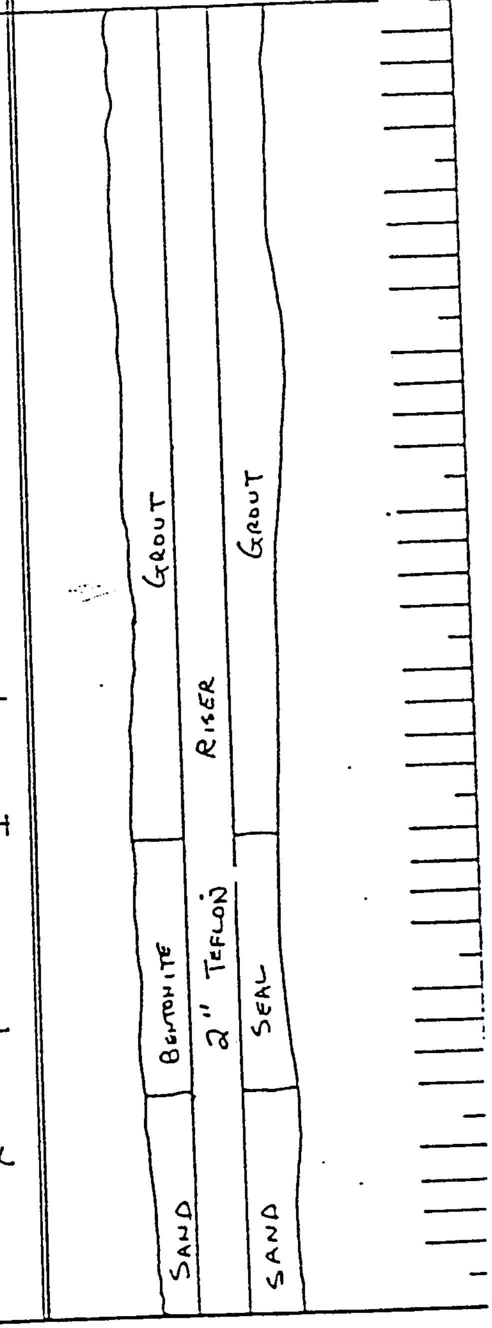
CLIENT MONSANTO

PROJECT QUEENY - SUBSURFACE INVESTIGATION

GEOLOGIST KEN MEYER

DEPTH	SAMPLE INTERVAL	SAMPLE # AND TYPE	BLOWS PER 6 INCHES	DESCRIPTION AND REMARKS	DEPTH, FT.	USCS SYMBOL AND INTERVAL
0.0						
5						
		SB-E1	1 1 2 18"	BROWN-GRAY CLAY, FIRM, SL. PLASTC COHESIVE SL. SILTY, SL. MOIST		CL
5.0		SB-E2	1 1 2 18"	BROWN-GRAY CLAY AS ABOVE		CL
5		SB-E3	1 2 3 18"	BROWN-GRAY CLAY AS ABOVE		CL
10.0		SB-E4	1 3 4 18"	BROWN GRAY CLAY AS ABOVE TO 11.0' / DARK BROWN SILTY CLAY, CRUMBLY, SL. MOIST		CL
2.5	▼	SB-E5	1 1 2 18"	DARK GRAY CLAYEY SILT, MOIST, PLASTIC COHESIVE		mH
15.0		SB-E6	1 3 4 18"	GRAY CLAYEY SILT AS ABOVE TO 16.0' / LT. BROWN CLAYEY SILT, SL. SANDY, COHESIVE SL. SANDY, MOTTLED		mL
17.5		SB-67	1 1 2 18"	BROWN CLAYEY SILT, MOTTLED, SL. SANDY WORM TUBES, COHESIVE SL. PLASTIC		mL
20.0						

WELL SKETCH



METHOD OF DRILLING Hollow Stem Auger

HOLE DIAMETER 7"

COMPLETION DEPTH 30.0'

WATER LEVEL

WELL DIAMETER 2"

WELL MATERIAL TEFLON

WELL DEVELOPMENT SURGE + PUMP

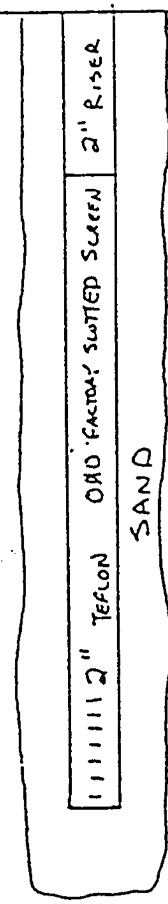
WATER LEVEL INITIAL ______ FINAL ______

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

BORING NUMBER: SBE / mw A
CLIENT: Monsanto
DATE DRILLED:
PROJECT: Queeny - Subsurface Investigation
ELEVATION:
GEOLOGIST: Ken Meyer

DEPTH, FT.	SAMPLE INTERVAL	SAMPLE # AND TYPE	BLOWS PER 6 INCHES	DESCRIPTION AND REMARKS	DEPTH, FT.	USCS SYMBOL AND INTERVAL
20.0		SB-E8	1 1 3 18"	Lt. Brown, V. Silty, V. Fine Sand Stratified, Ironstaining, Well Sorted		SM
22.5		SB-E9	1 3 3 18"	Lt. Brown V. Silty Fine Sand, Stratified, Iron Staining, Sl. Clayey Sorted		SM
25.0		SB-E10	4 5 6 18"	Lt. Brown Silty Fine Sand, Turning Gray, Hard, Stratified		SM
27.5		SB-E11	3 6 12 18"	Fine to medium sand Dark Gray Hard, Stratified, Well Graded		SW
30.0		SB-E12	3 6 8 18"	Fine to medium Sand - As Above		SW
				Bedrock		
32.5						

WELL SKETCH

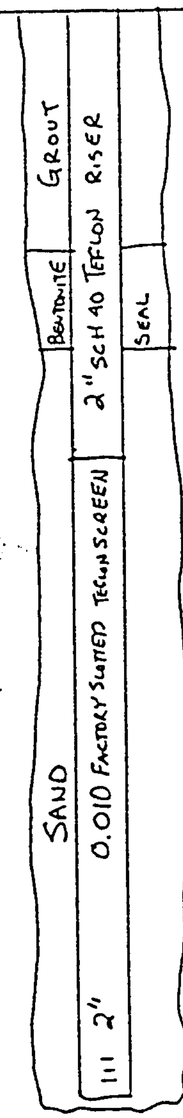


METHOD OF DRILLING: Hollow Stem Auger
HOLE DIAMETER: 7"
COMPLETION DEPTH: 30.0
WATER LEVEL:
WELL DIAMETER: 2"
WELL MATERIAL: Teflon
WELL DEVELOPMENT: Surge + Pump
WATER LEVEL INITIAL: FINAL:

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

BORING NUMBER MW B
CLIENT Monsanto
DATE DRILLED 5-10-85
PROJECT Queeny - SubSurface Investigation
ELEVATION
GEOLOGIST Ken Meyer

DEPTH, FT.	SAMPLE INTERVAL	SAMPLE # AND TYPE	BLOWS PER 6 INCHES	DESCRIPTION AND REMARKS	DEPTH, FT.	USCS SYMBOL AND INTERVAL	WELL SKETCH
0				SEE DESCRIPTION FOR SB-E/ MW-A	0		0
2.5					2.5		2.5
5.0					5.0		5.0
7.5					7.5		7.5
10.0					10.0		10.0
12.5					12.5		12.5
15.0					15.0		15.0
17.5					17.5		17.5



METHOD OF DRILLING Hollow Stem Auger.
HOLE DIAMETER 7"
COMPLETION DEPTH 17'
WATER LEVEL
WELL DIAMETER 2"
WELL MATERIAL Teflon
WELL DEVELOPMENT Surge + Pump
WATER LEVEL INITIAL ____ FINAL ____

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

BORING NUMBER SA-F MW C

DATE DRILLED 5-10-85

ELEVATION

CLIENT Monsanto

PROJECT Queeny - Sub Surface Investigation

GEOLOGIST Ken Meyer

DEPTH, FT.	SAMPLE INTERVAL	SAMPLE # AND TYPE	BLOWS PER 6 INCHES	DESCRIPTION AND REMARKS	DEPTH, FT.	USCS SYMBOL AND INTERVAL	WELL SKETCH
0				Water at 0.5' Gravel fill to 7.0' Bricks and wood to 7.5' Drilled to 10.0' for first sample	0		Grout
2.5					2.5		
5.0					5.0		Bentonite Seal; 2" Sch 40 PVC Riser
7.5					7.5		
10.0		SB-F4	3 1 2 8"	Gray clayey silt, moist, soft plastic, cohesive	10.0	mH	Sand; 2" Sch 40 0.010 Factory Slotted PVC Screen
12.5		SB-F5	1 1 2 12"	Gray clayey silt, mottled to black plastic, cohesive, soft	12.5	mH	
15.0		SB-F6	1 1 1 15"	Gray clayey silt, sl. mottled sl sandy, plastic, cohesive soft	15.0	mH	
17.5		SB-F7	0 1 2 18"	Gray v. silty, v fine sand, v. moist cohesionless, low strength	17.5	sm	
20.0					20.0		

METHOD OF DRILLING Hollow Stem Auger

HOLE DIAMETER 7"

COMPLETION DEPTH 20'

WATER LEVEL

WELL DIAMETER 2"

WELL MATERIAL PVC

WELL DEVELOPMENT Surge + Pump

WATER LEVEL INITIAL ______ FINAL ______

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

BORING NUMBER SB-G
DATE DRILLED 5-14-85
ELEVATION

CLIENT MONSANTO
PROJECT QUEENY - SUB SURFACE INVESTIGATION
GEOLOGIST KEN MEYER

DEPTH, FT.	SAMPLE INTERVAL	SAMPLE # AND TYPE	BLOWS PER 6 INCHES	DESCRIPTION AND REMARKS	DEPTH, FT.	USCS SYMBOL AND INTERVAL	WELL SKETCH
0.0							
2.5							
		SB-G1	1 2 4 15"	GRAY CLAY, SL. MOTTLED, FIRM, COHESIVE V. SL. PLASTIC MOIST		CL	
5.0		SB-G2	1 2 4 18"	GRAY CLAY, SL. MOTTLED, V. FIRM, SL. SILTY, SL. MOIST		CL	
7.5				GRAY CLAY AS ABOVE TO 8.5		CL	
		SB-G3	1 2 3 15"	GRAY MOTTLED CLAY, CRUMBLY SL. MOIST, SL. SILTY		CL	
10.0		SB-G4	1 1 2 15"	GRAY MOTTLED CLAY, SL. CRUMBLY SL. PLASTIC, MOIST, SL. SILTY		CL	
12.5							

METHOD OF DRILLING Hollow Stem Auger
HOLE DIAMETER 7"
COMPLETION DEPTH
WATER LEVEL

WELL DIAMETER
WELL MATERIAL
WELL DEVELOPMENT
WATER LEVEL INITIAL FINAL

BORING NUMBER SB-H

DATE DRILLED 5-8-85

ELEVATION

CLIENT MONSANTO

PROJECT QUEENY- SUB SURFACE INVESTIGATION

GEOLOGIST KEN MEYER

DEPTH, FT.	SAMPLE INTERVAL	SAMPLE # AND TYPE	BLOWS PER 6 INCHES	DESCRIPTION AND REMARKS	DEPTH, FT.	USCS SYMBOL AND INTERVAL	WELL SKETCH
0.0							
2.5							
		SB-H1	1 4 5 15"	GRAY CLAY, SL MOTTLED, FIRM, COHESIVE V. SL. PLASTIC, MOIST		CL	
5.0		SB-H2	1 2 4 15"	GRAY CLAY, SL. MOTTLED, V. FIRM, SL SILTY COHESIVE, SL. MOIST		CL	
7.5		SB-H3	1 4 5 17"	GRAY CLAY AS ABOVE TO 8.5		CL	
				GRAY MOTTLED CLAY, CRUMBLY SL. MOIST SL. SILTY		CL	
10.0		SB-H4	1 3 3 18"	GRAY MOTTLED CLAY SL CRUMBLY SL PLASTIC MOIST SL SILTY		CL	
12.5							

METHOD OF DRILLING Hollow Stem Auger

HOLE DIAMETER 7"

COMPLETION DEPTH

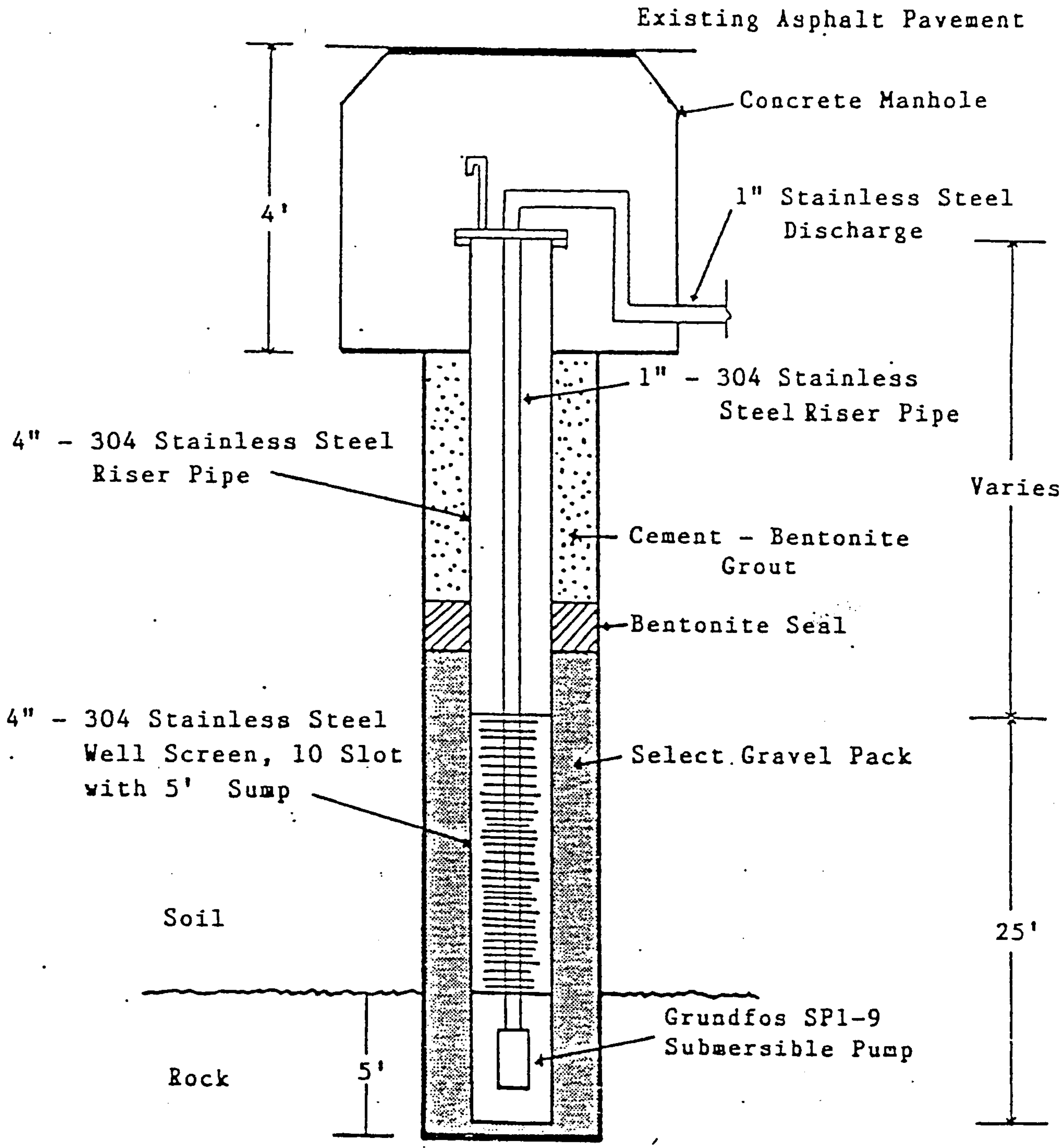
WATER LEVEL

WELL DIAMETER

WELL MATERIAL

WELL DEVELOPMENT

WATER LEVEL INITIAL ____ FINAL ____



Typical PCE Recovery Well
Monsanto - Queeny Plant
St. Louis, Missouri

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

~~Boring~~/Well GM-1 Project/No. Monsanto N0308QU2 Page 1 of 1

Site Location St. Louis, MO Drilling Started 11/17/86 Drilling Completed 11/18/86

Total Depth Drilled 11.75 feet Hole Diameter 8 inches Type of Sample/ Coring Device Split Spoon

Length and Diameter of Coring Device 2'/ $1\frac{1}{2}$" Sampling Interval Continuous feet

Land-Surface Elev. ______ feet ☐ Surveyed ☐ Estimated Datum ______

Drilling Fluid Used None Drilling Method Hollow Stem Auger

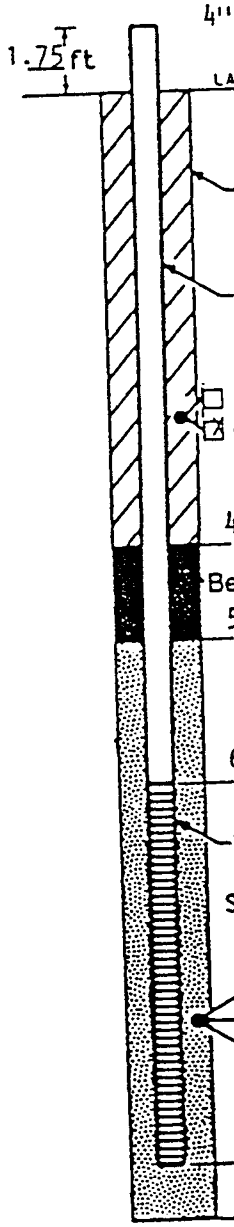
Drilling Contractor John Mathes, Inc. Driller David Gotto Helper Brian Blum

Prepared By D. Colton Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	2	1.5	10-7-8-10	Fill - chat and brown silt
2	4	1.5	7-7-8-10	Clay, gray and brown, dense
4	6	2.0	2-3-5-8	do
6	8	2.0	9-12-18-20	do (wet)
8	10	2.0	8-9-10-11	do
10	11	1.0	8-9	Clay, silty, gray and brown; trace fine sand
11	11.75	0.75	5-3	do
11.75				Bedrock

GERAGHTY & MILLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG



4" Dia Protective Sleeve

1.75 ft

LAND SURFACE

8 inch diameter drilled hole

Well casing, 2 inch diameter, Steel

☐ Backfill
☒ Grout Pre-mix

4.5 ft*

Bentonite ☐ slurry ☒ pellets

5.5 ft*

6,75 ft*

Well Screen. 2 inch diameter Stainless 10 slot

☐ Gravel Pack
☐ Sand Pack
☐ Formation Collapse

11.75 ft*

_____ ft*

Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Monsanto N0308QU2 Well GM-1

Town/City St. Louis

County St. Louis State MO

Permit No. ____________

Land-Surface Elevation and Datum ________ feet ☐ surveyed ☐ estimated

Installation Dates(s) 11/17/18/86

Drilling Method Hollow Stem Auger

Drilling Contractor John Mathes

Drilling Fluid None

Development Techniques(s) and Date(s)

Bailing 11/20/86

Fluid Loss During Drilling None gallons

Water Removed During Development 7.5 gallons

Static Depth to Water 5' below ground feet below M.P.

Pumping Depth to Water ________ feet below M.P.

Pumping Duration ________ hours

Yield ________ gpm Date ________

Specific Capacity ________ gpm/ft

Well Purpose Monitoring

Remarks Bailed dry during development

Prepared by Brian A. Blum

1/86

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

Boring/Well GM-2 Project/No. Monsanto N03080U2 Page 1 of 1

Site Location St. Louis, MO Drilling Started 11/18/86 Drilling Completed 11/18/86

Total Depth Drilled 9.75 feet Hole Diameter 8 inches Type of Sample/Coring Device Split Spoon

Length and Diameter of Coring Device 2'/1½" Sampling Interval Continuous feet

Land-Surface Elev. ______ feet ☐ Surveyed ☐ Estimated Datum ______

Drilling Fluid Used None Drilling Method Hollow Stem Auger

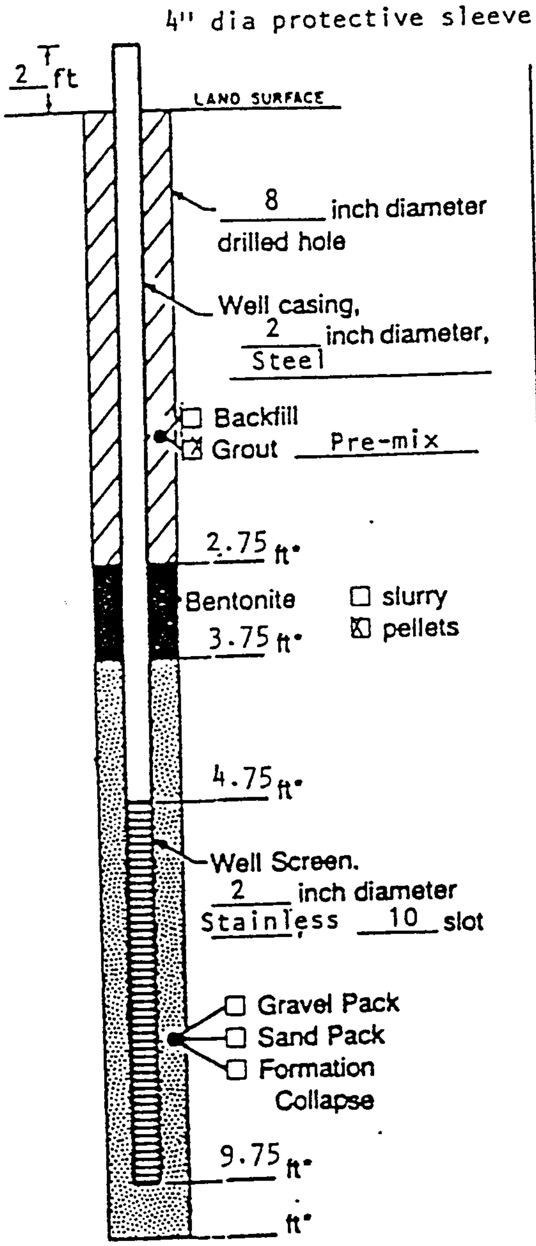
Drilling Contractor John Mathes, Inc. Driller David Gotto Helper Culle D.

Prepared By Brian A. Blum Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	2	1.25	10-4-3-3	Fill - chat and brown silt
2	4	1.5	3-4-6-9	Fill - brown silt and fine sand (top 6") clay, gray
4	6	2	3-4-7-12	Clay, gray-brown; dense
6	8	2	13-14-13-14	same as above
8	10	0.15	2-4-5-8*	same as above; less dense
	9.75			Refusal
				* Spoon bounces off solid surface after 3"

GERAGHTY & MILLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Monsanto N0308QU2 Well GM-2

Town/City St. Louis

County St. Louis State MO

Permit No. ____

Land-Surface Elevation and Datum ____ feet ☐ surveyed ☐ estimated

Installation Dates(s) 11/18/86

Drilling Method Hollow Stem Auger

Drilling Contractor John Mathes

Drilling Fluid None

Development Techniques(s) and Date(s)

Bailing 11/20/86

Fluid Loss During Drilling None gallons

Water Removed During Development 6.0 gallons

Static Depth to Water 5' below ground feet below M.P.

Pumping Depth to Water ____ feet below M.P.

Pumping Duration ____ hours

Yield ____ gpm Date ____

Specific Capacity ____ gpm/ft

Well Purpose Monitoring

Remarks Bailed dry during development

Prepared by Brian A. Blum

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

~~Boring~~/Well GM-3 Project/No. Monsanto N0308QU2 Page 1 of 1

Site Location St. Louis, MO Drilling Started 11/18/86 Drilling Completed 11/19/86

Total Depth Drilled 9.5 feet Hole Diameter 8 inches Type of Sample/Coring Device Split Spoon

Length and Diameter of Coring Device 2'/1½" Sampling Interval Continuous feet

Land-Surface Elev. ______ feet ☐ Surveyed ☐ Estimated Datum ______

Drilling Fluid Used None Drilling Method Hollow Stem Auger

Drilling Contractor John Mathes, Inc. Driller David Gotto Helper Culle D.

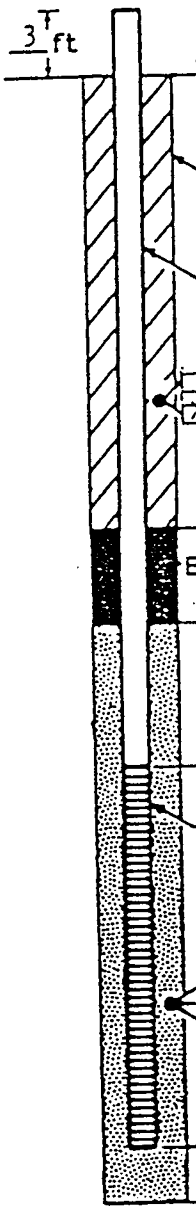
Prepared By Brian A. Blum Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	2	1.5	7-5-8-6	Fill; chat and brown silt grading to firm clay
2	4	2.0	7-9-11-	Clay, brown; firm (not as dense as previous borings)
			11	
4	6	2.0	2-4-6-8	Same as above, dense
6	8	2.0	12-13-	Same as above
			14-13	
8	10		4-5-7	Same as above
	9.5			Refusal

GERAGHTY & MILLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG

4" Dia Protective Sleeve



8 inch diameter drilled hole

Well casing, 2 inch diameter, Steel

☐ Backfill
☒ Grout Pre-mix

2.5 ft*

Bentonite ☐ slurry ☒ pellets

3.5 ft*

4.5 ft*

Well Screen. 2 inch diameter Stainless 10 slot

☐ Gravel Pack
☐ Sand Pack
☐ Formation Collapse

9.5 ft*

ft*

Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Monsanto N0308QU2 Well GM-3

Town/City St. Louis

County St. Louis State MO

Permit No.

Land-Surface Elevation and Datum feet ☐ surveyed ☐ estimated

Installation Dates(s) 11/18/19/86

Drilling Method Hollow Stem Auger

Drilling Contractor John Mathes

Drilling Fluid None

Development Techniques(s) and Date(s)
Bailing 11/20/86

Fluid Loss During Drilling None gallons

Water Removed During Development 7.5 gallons

Static Depth to Water 2' below ground feet below M.P.

Pumping Depth to Water feet below M.P.

Pumping Duration hours

Yield gpm Date

Specific Capacity gpm/ft

Well Purpose Monitoring

Remarks At first the boring did not have water. However, it filled in overnight: Bailed dry during development.

Prepared by Brian A. Blum

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

~~Boring~~/Well GM-4 Project/No. Monsanto N0308QU2 Page 1 of 1

Site Location St. Louis, MO Drilling Started 11/20/86 Drilling Completed 11/20/86

Total Depth Drilled 9.5 feet Hole Diameter 8 inches Type of Sample/ Coring Device Split Spoon

Length and Diameter of Coring Device 2'/1½" Sampling Interval Continuous feet

Land-Surface Elev. ______ feet ☐ Surveyed ☐ Estimated Datum ______

Drilling Fluid Used None Drilling Method Hollow Stem Auger

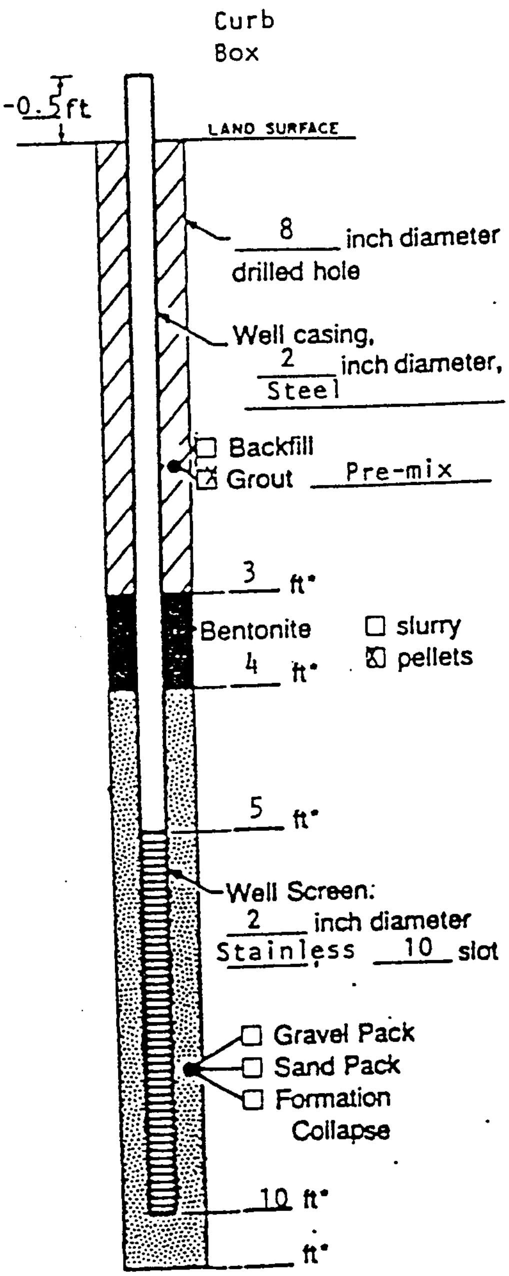
Drilling Contractor John Mathes, Inc. Driller David Gotto Helper Culle D.

Prepared By Brian A. Blum Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	3	-	-	Fill: Top 6" asphalt, chat, 6" concrete, heterogeneous
				mixture of sand and gravel
3	5	1	2-6-3-3	Fill: chat top 6" grading into clay, gray
5	7	2	4-6-10-	Clay, gray; dense
			12	
7	9	2	4-6-9-10	Same as above
9	11	.5	9	Same as above
	9.5			Refusal

GERAGHTY & MILLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Monsanto N0308QU2 Well GM-4

Town/City St. Louis

County St. Louis State MO

Permit No. ______

Land-Surface Elevation and Datum ______ feet ☐ surveyed ☐ estimated

Installation Dates(s) 11/20/86

Drilling Method Hollow Stem Auger

Drilling Contractor John Mathes

Drilling Fluid None

Development Techniques(s) and Date(s)

Bailing 11/20/86

Fluid Loss During Drilling None gallons

Water Removed During Development 15 gallons

Static Depth to Water 2 below ground feet below M.P.

Pumping Depth to Water ______ feet below M.P.

Pumping Duration ______ hours

Yield ______ gpm Date ______

Specific Capacity ______ gpm/ft

Well Purpose Monitoring

Remarks ______

Prepared by Brian A. Blum

1/86

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

~~Boring~~/Well GM-5 Project/No. Monsanto N0308QU2 Page 1 of 1

Site Location St. Louis, MO Drilling Started 11/21/86 Drilling Completed 11/21/86

Total Depth Drilled 16.5 feet Hole Diameter 8 inches Type of Sample/Coring Device Split Spoon

Length and Diameter of Coring Device 2'/1½" Sampling Interval Continuous feet

Land-Surface Elev. ____ feet ☐ Surveyed ☐ Estimated Datum ____

Drilling Fluid Used None Drilling Method Hollow Stem Auger

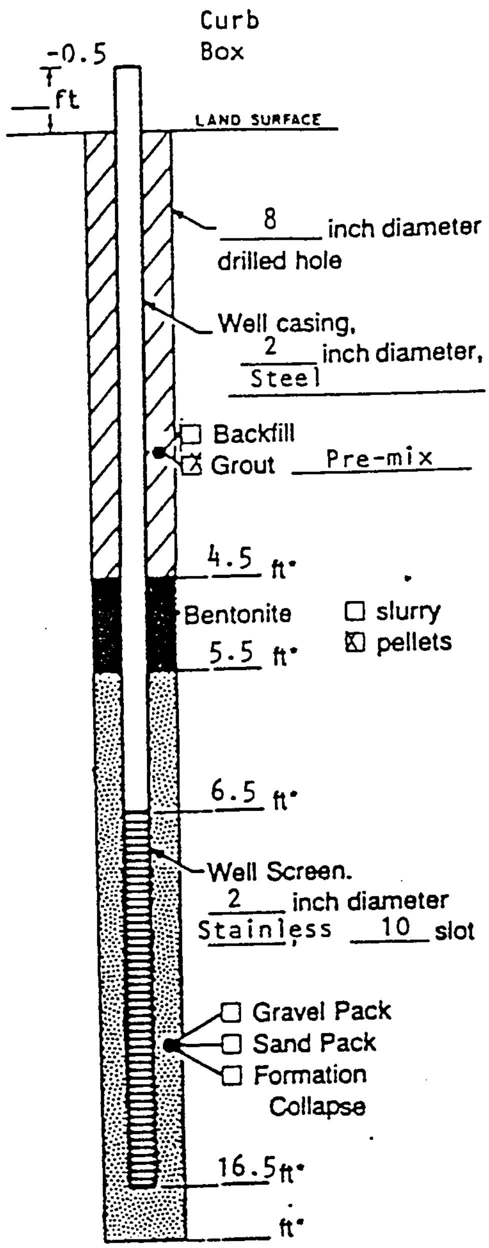
Drilling Contractor John Mathes, Inc. Driller David Gotto Helper Culle D.

Prepared By Brian A. Blum Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	1	-	-	Asphalt and fill; gravel
1	3	1.5	4-5-7-9	Fill; sand, coarse and gravel, into clay, brown; to silt
3	5	2.0	10-7-7-9	Clay, brown; with silt and moist
5	7	2	4-7-7-7	Same as above
7	9	2	8-11-3-5	Same as above
9	11	2	9-10-7-8	Clay, brown grading to silt
11	13		11-24-7-13	Silt, brown moist grading to sand, medium to coarse
13	14	1	10-14	Sand, medium to coarse (65%), silt (35%)
16	16.5	0.5	2	Silt and clay, brown-gray
	16.5			Refusal

GERAGHTY & MILLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Monsanto N0308QU2 Well GM-5

Town/City St. Louis

County St. Louis State MO

Permit No. ____

Land-Surface Elevation and Datum ____ feet ☐ surveyed ☐ estimated

Installation Dates(s) 11/21/86

Drilling Method Hollow Stem Auger

Drilling Contractor John Mathes

Drilling Fluid None

Development Techniques(s) and Date(s)

Bailing

Fluid Loss During Drilling None gallons

Water Removed During Development ____ gallons

Static Depth to Water ____ feet below M.P.

Pumping Depth to Water ____ feet below M.P.

Pumping Duration ____ hours

Yield ____ gpm Date ____

Specific Capacity ____ gpm/ft

Well Purpose Monitoring

Remarks ____

Prepared by Brian A. Blum

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

Boring/~~Well~~ B-1 Project/No. Monsanto N0308QU2 Page 1 of 1

Site Location St. Louis, MO Drilling Started 11/18/86 Drilling Completed 11/18/86

Total Depth Drilled ____ feet Hole Diameter 8 inches Type of Sample/Coring Device Split Spoon

Length and Diameter of Coring Device 2'/1½" Sampling Interval Continuous feet

Land-Surface Elev. ____ feet ☐ Surveyed ☐ Estimated Datum ____

Drilling Fluid Used None Drilling Method Hollow Stem Auger

Drilling Contractor John Mathes, Inc. Driller David Gotto Helper Culle D.

Prepared By Brian A. Blum Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	2	1.5	7-4-5-7	Fill: chat (pink discoloration) clay, brown
2	4	0.5	7-10-11-13	Clay, brown
4	6	2.0	2-3-6-9	Clay, gray-brown; dense
6	8	2.0	16-15-14-14	Same as above
8	10	2.0	3-5-7-7	Same as above; less dense, to silt
10	11	1.0	7-7 refusal	Same as above
	11			Refusal

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

Boring/~~Well~~ B-2 Project/No. Monsanto N0308QU2 Page 1 of 1

Site Location St. Louis, MO Drilling Started 11/19/86 Drilling Completed 11/19/86

Total Depth Drilled 9.75 feet Hole Diameter 8 inches Type of Sample/Coring Device Split Spoon

Length and Diameter of Coring Device 2'/1½" Sampling Interval Continuous feet

Land-Surface Elev. ______ feet ☐ Surveyed ☐ Estimated Datum ______

Drilling Fluid Used None Drilling Method Hollow Stem Auger

Drilling Contractor John Mathes, Inc. Driller David Gotto Helper Culle D.

Prepared By Brian A. Blum Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	2	1.5	8-10-13-8	Fill: chat and sand, medium brown (pink discoloration)
2	4	1.0	6-5-4-3	Same as above; bright pink-purple color
4	6	0	2-2-2-1	No recovery
6	8	0	7-4-3-2	No recovery in spoon: pulled center plug and had fill coarse sand/gravel
8	10	9.75	3-9-10-10*	Fill: chat and sand; same as at top
		9.75		Refusal
				* 3" and Refusal

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

Boring/~~Well~~ B-3 Project/No. Monsanto N0308QU2 Page 1 of 1

Site Location St. Louis, MO Drilling Started 11/19/86 Drilling Completed 11/19/86

Total Depth Drilled 9.0 feet Hole Diameter 8 inches Type of Sample/Coring Device Split Spoon

Length and Diameter of Coring Device 2'/1½" Sampling Interval Contiuous feet

Land-Surface Elev. ______ feet ☐ Surveyed ☐ Estimated Datum ______

Drilling Fluid Used None Drilling Method Hollow Stem Auger

Drilling Contractor John Mathes, Inc. Driller David Gotto Helper Culle D.

Prepared By Brian A. Blum Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	1	-	-	Chat and concrete
1	3	1.25	3-1-2-4	Clay, black; dense
3	5	2	3-4-6-9	Same as above
5	7	2	12-13- 14-17	Same as above
7	9	2	3-4-7-8	Same as above
9	11	-		
	9			Refusal

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

Boring/~~Well~~ B-4 Project/No. Monsanto N0308QU2 Page 1 of 1

Site Location St. Louis, MO Drilling Started 11/20/86 Drilling Completed 11/20/86

Total Depth Drilled 8.75 feet Hole Diameter 8 inches Type of Sample/Coring Device Split Spoon

Length and Diameter of Coring Device 2'/1½" Sampling Interval Continuous feet

Land-Surface Elev. ______ feet ☐ Surveyed ☐ Estimated Datum ______

Drilling Fluid Used None Drilling Method Hollow Stem Auger

Drilling Contractor John Mathes, Inc. Driller David Gotto Helper Culle D.

Prepared By Brian A. Blum Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	1.75	.75	8-10-8-	Fill: chat and sand, medium light brown, spoon
			25	refusal at 1.75' (0.5' concrete)
2	4	1.0	1-10-13	Clay, gray: wet
			14	
4	6	2	5-3-6-9	Clay, gray: wet
6	8		11-15-	Clay, gray: wet
			14-16	
8	10		4-8	Same as above
	8.75			Refusal

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

Boring/~~Well~~ B-5 Project/No. Monsanto N03080U2 Page 1 of 1

Site Location St. Louis, MO Drilling Started 11/21/86 Drilling Completed 11/21/86

Total Depth Drilled 12.5 feet Hole Diameter 8 inches Type of Sample/Coring Device Split Spoon

Length and Diameter of Coring Device 2'/1½" Sampling Interval Continuous feet

Land-Surface Elev. ______ feet ☐ Surveyed ☐ Estimated Datum ______

Drilling Fluid Used None Drilling Method Hollow Stem Auger

Drilling Contractor John Mathes, Inc. Driller David Gotto Helper Culle D.

Prepared By Brian A. Blum Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	1	-	-	Asphalt top 6" fill; chat and gravel
1	3	0.25	4-5-5-6	Silt, brown with pink discoloration
3	5	1.25	6-4-5-8	Sand, medium (50%), silt (50%) grading to clay; gray
5	7	2	10-11-13-16	Sand, medium to coarse, gray grading to clay, gray
7	9	-	7-9-10-15	No sample
9	11	2	6-8-12-14	Clay, brown; with silt
11	13		8-11-14	Same as above
	12.5			Refusal

APPENDIX C

PHOTOGRAPHIC DOCUMENTATION

FINAL RCRA FACILITY ASSESSMENT REPORT
MONSANTO-QUEENY PLANT
ST. LOUIS, MISSOURI

PHOTOGRAPH NO. 1
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: Laboratory Coalescer

Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1010

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: West

PHOTOGRAPH NO. 2
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: Laboratory Storage

Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1020

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: West

PHOTOGRAPH NO. 3
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: Former location of the Phenol Residue Tank

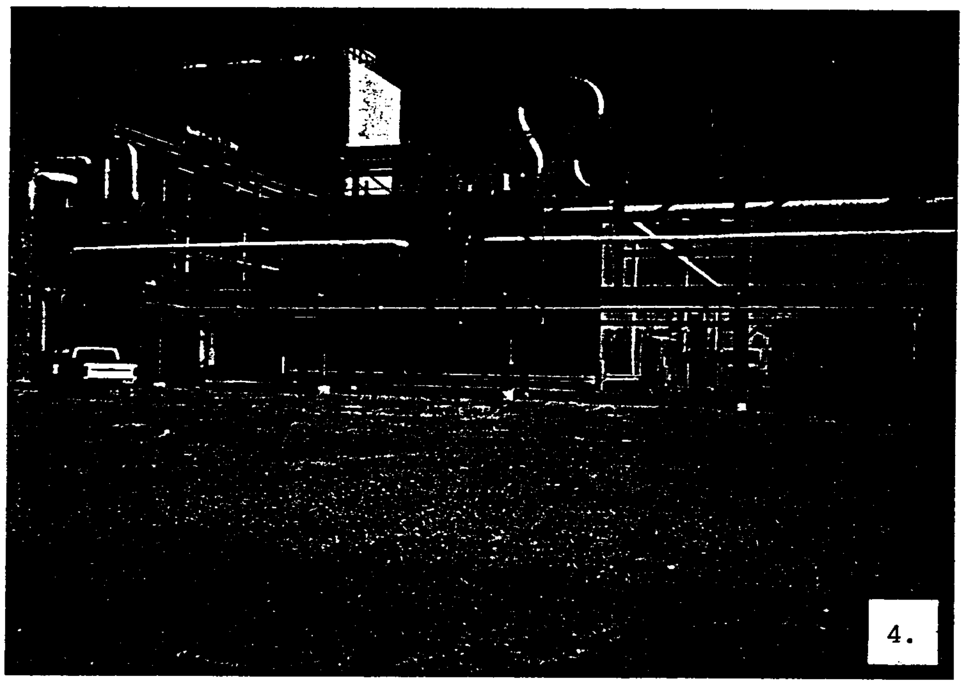
Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1025

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: Northwest



PHOTOGRAPH NO. 4
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: Area of Former Geyer Boiler

Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1025

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: Northwest

PHOTOGRAPH NO. 6
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: Drum Storage Lot

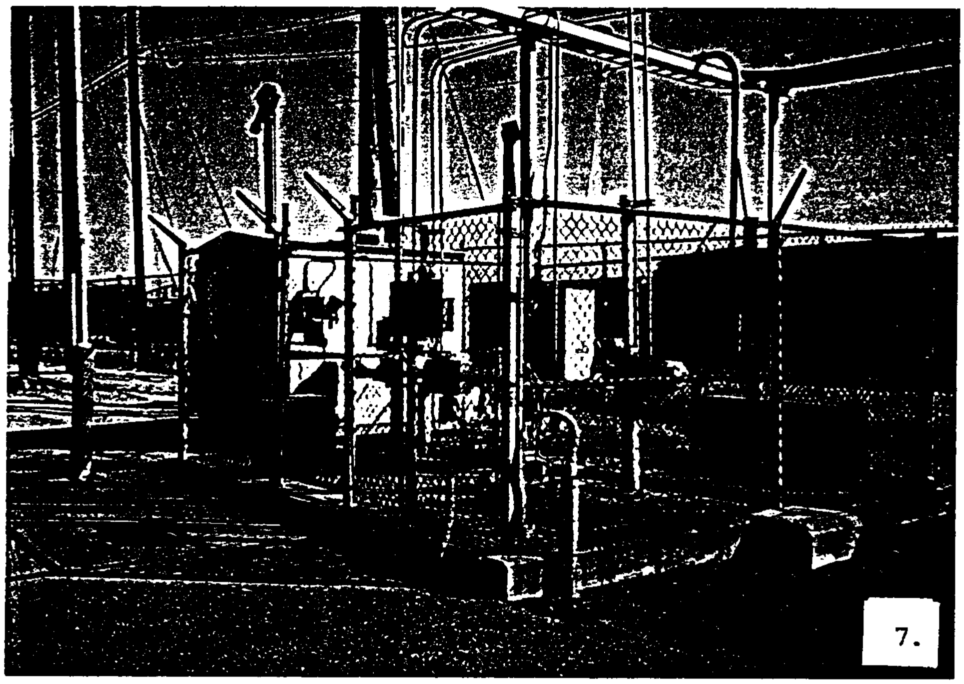
Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1030

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: West



PHOTOGRAPH NO. 7
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: Gate Well

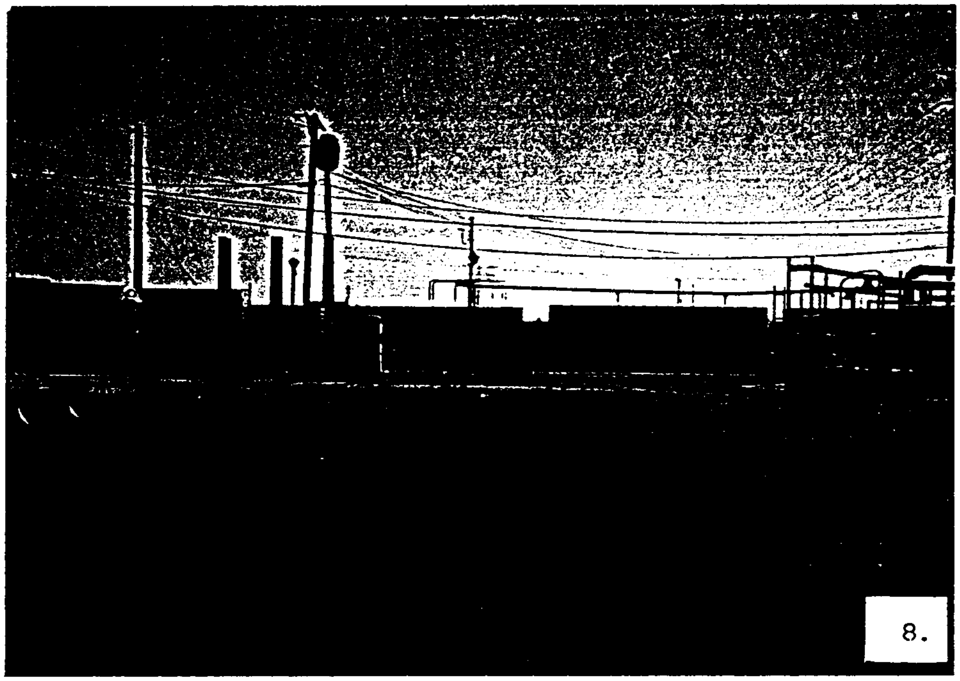
Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1045

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: Northeast



PHOTOGRAPH NO. 8
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: Gate Well

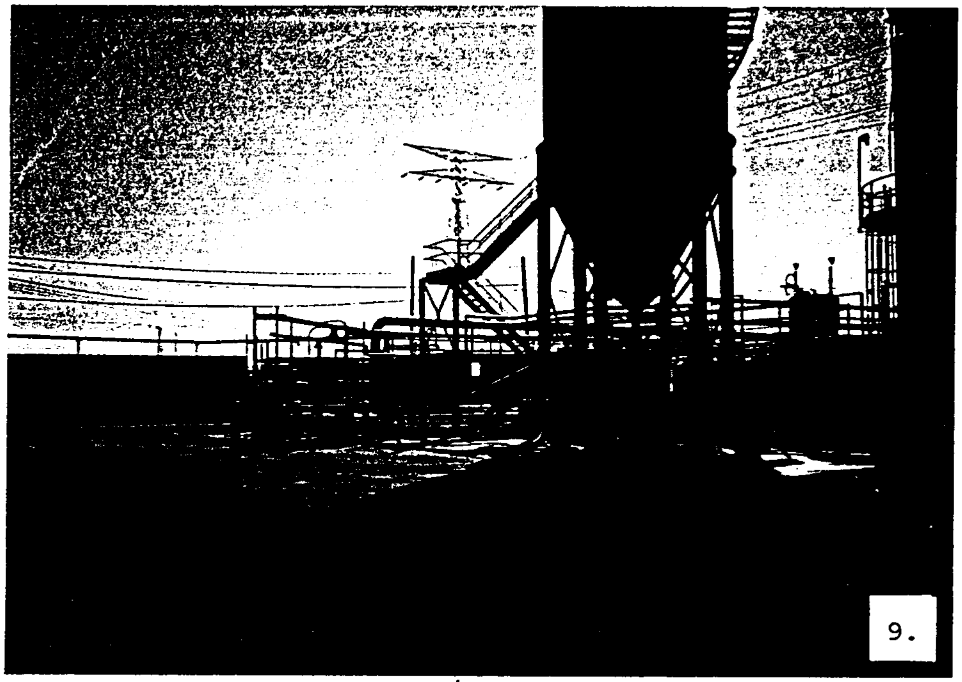
Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1045

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: East



PHOTOGRAPH NO. 9
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: Second Gate Well and Lime Storage

Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1047

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: East

PHOTOGRAPH NO. 10
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: Pump Pit

Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1050

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: South

PHOTOGRAPH NO. 11
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: Boiler Slag Pile

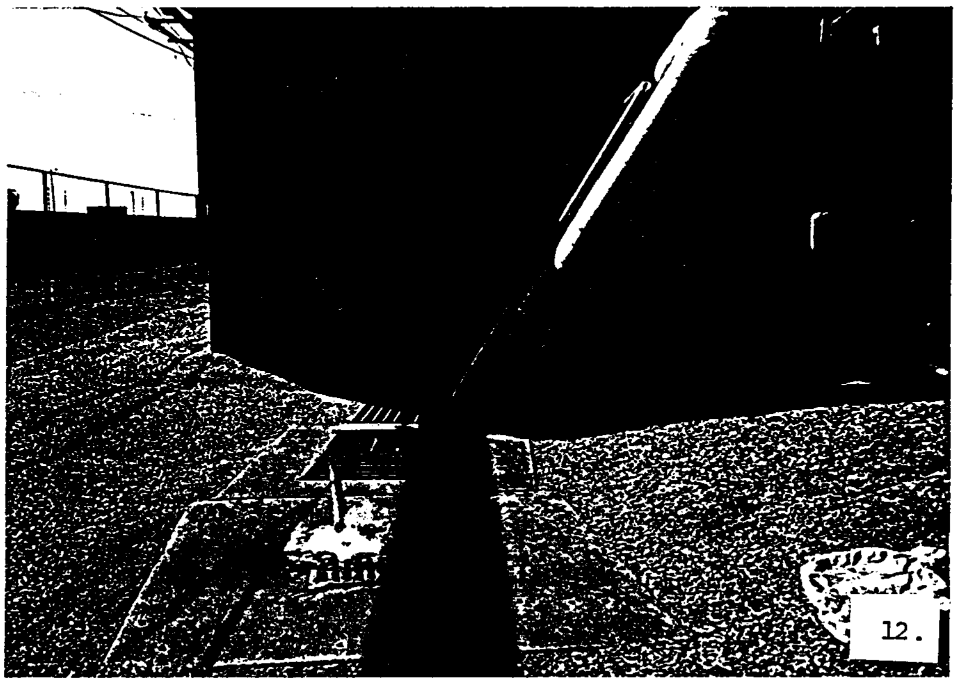
Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1055

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: Southeast



PHOTOGRAPH NO. 12
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: Clarifier

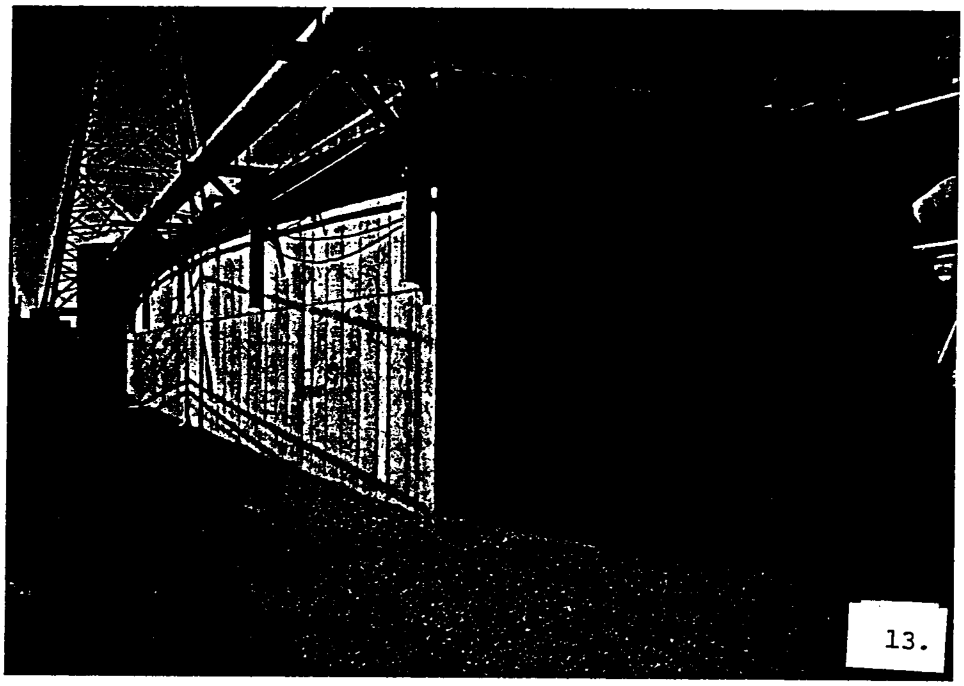
Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1100

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: South



PHOTOGRAPH NO. 13
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: Clarifier

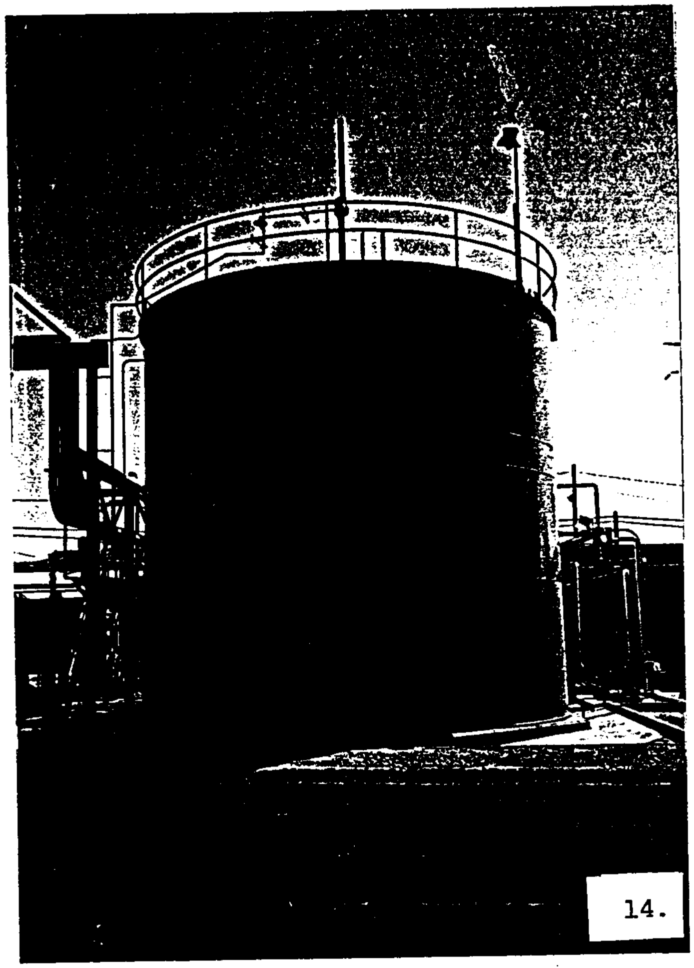
Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1100

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: Southwest



PHOTOGRAPH NO. 14
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: Used Oil Tank

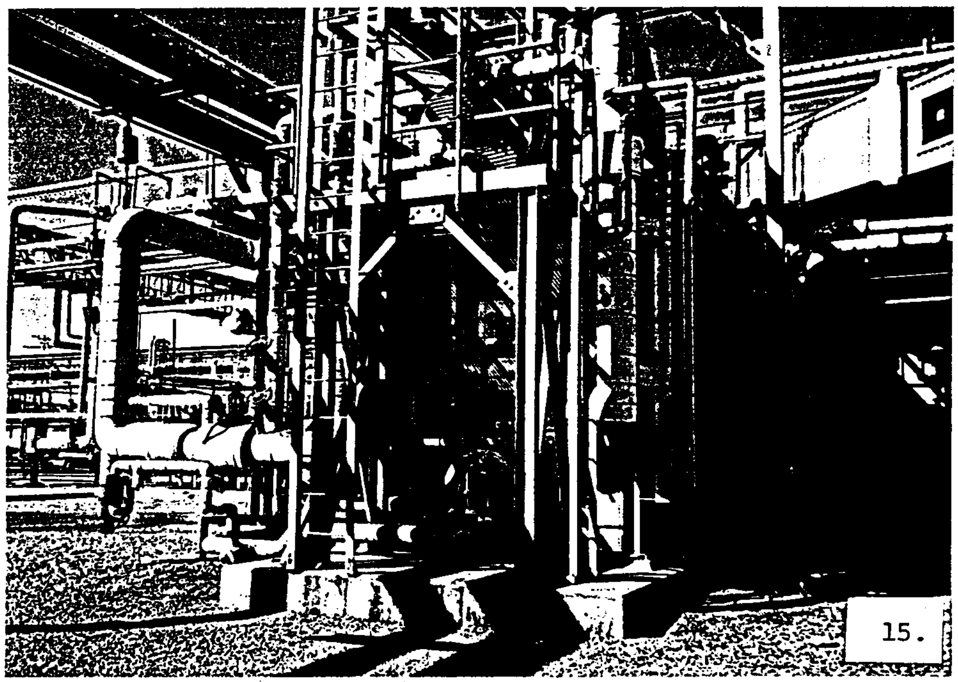
Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1105

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: East



PHOTOGRAPH NO. 15
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: Package Boiler

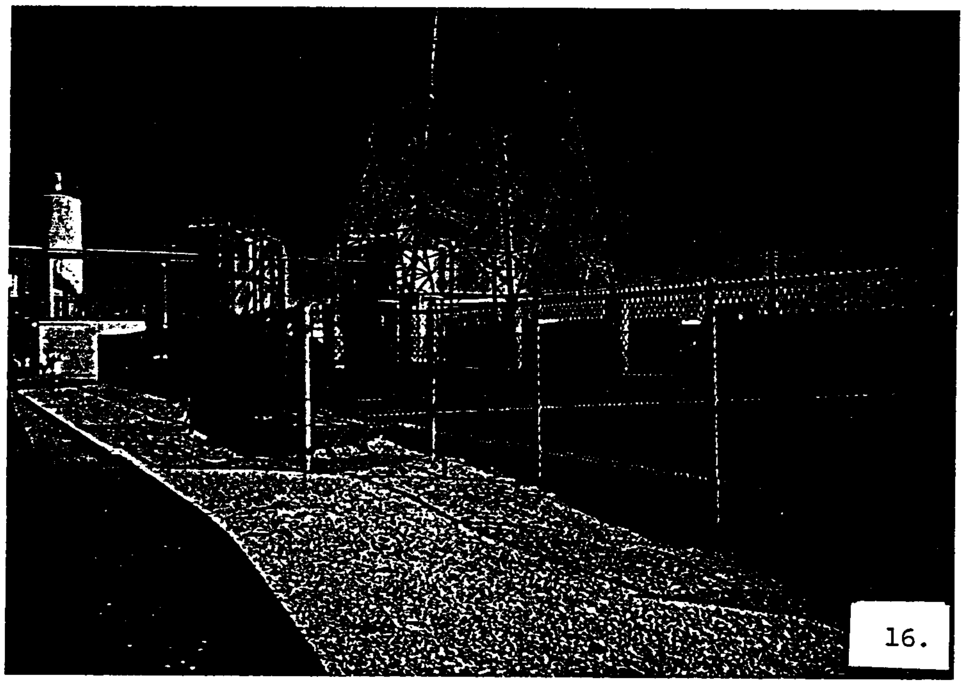
Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1110

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: West



PHOTOGRAPH NO. 16
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: CAC Spill Pond

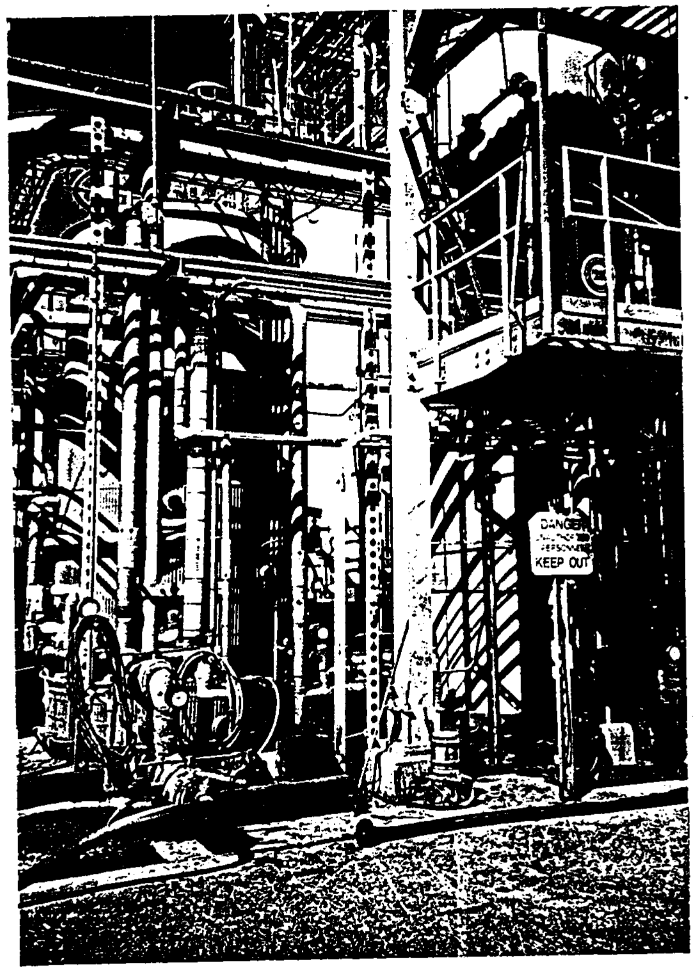
Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1115

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: West



PHOTOGRAPH NO. 17
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: CAC Incinerator Waste Storage Tanks

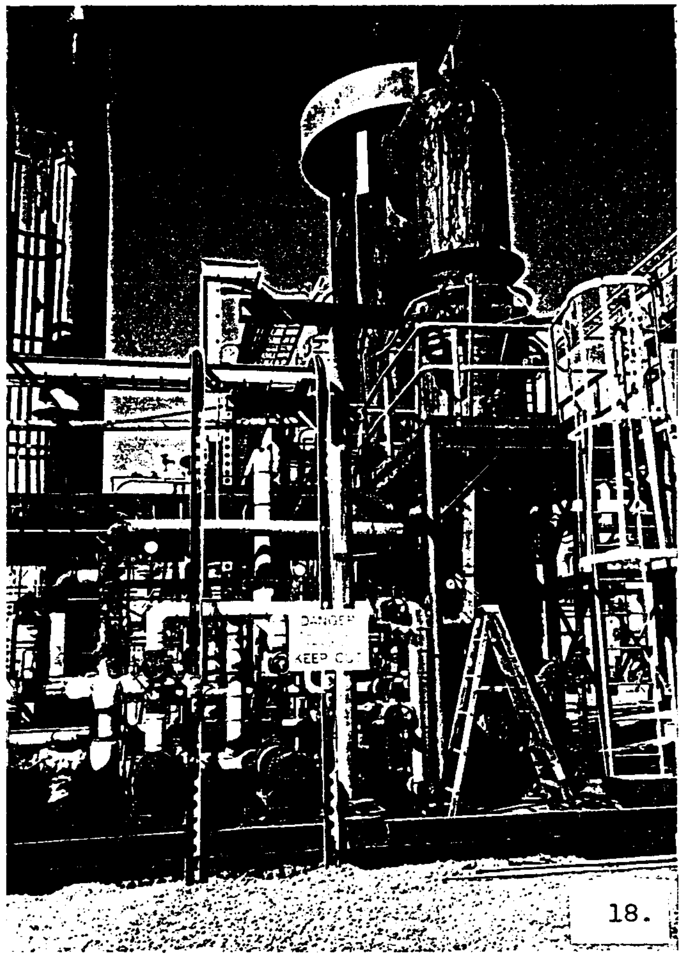
Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1115

Photographer: Carla Rellergert File No: 05-B667-00

Film: ASA 200 Kodak Witness: John Smith

Direction of Photograph: Northwest



PHOTOGRAPH NO. 18
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: CAC Incinerator

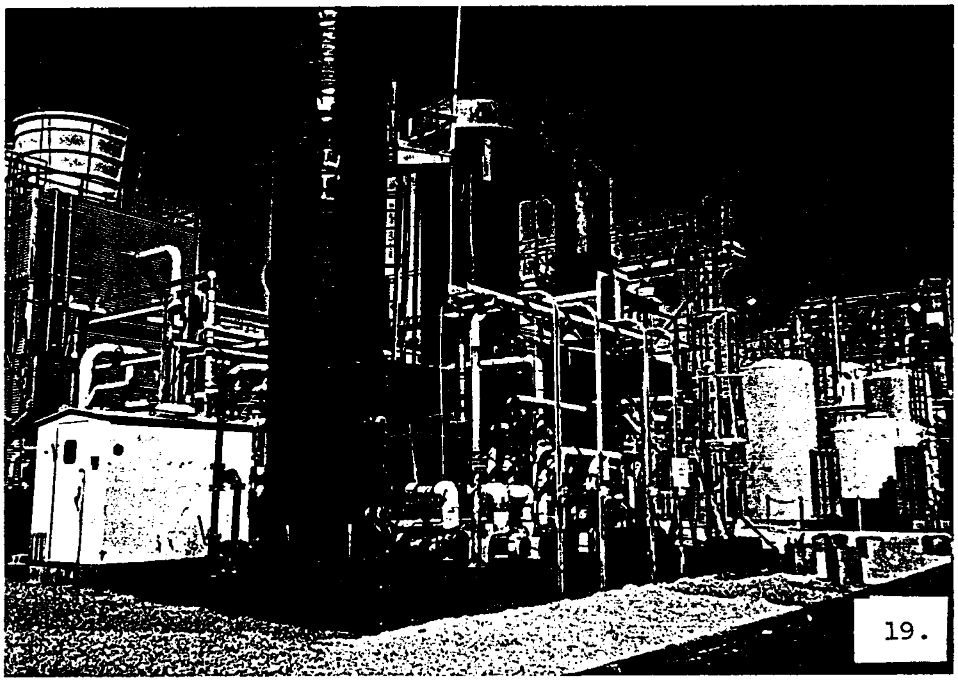
Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1120

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: West



PHOTOGRAPH NO. 19
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: CAC Incinerator

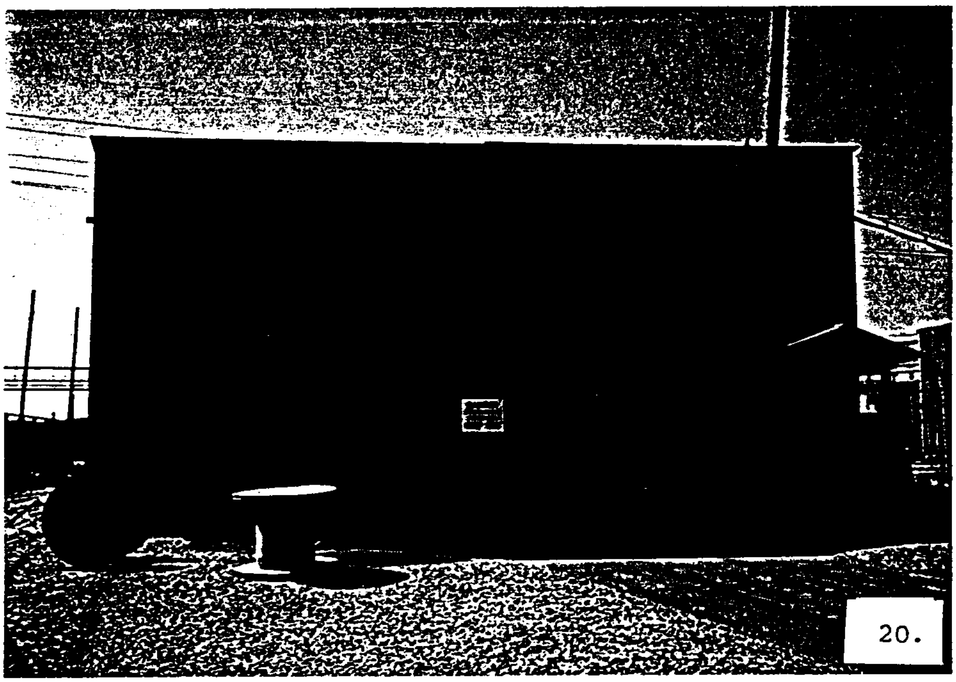
Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1125

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: Northwest



PHOTOGRAPH NO. 20
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: Dioxin Storage Building

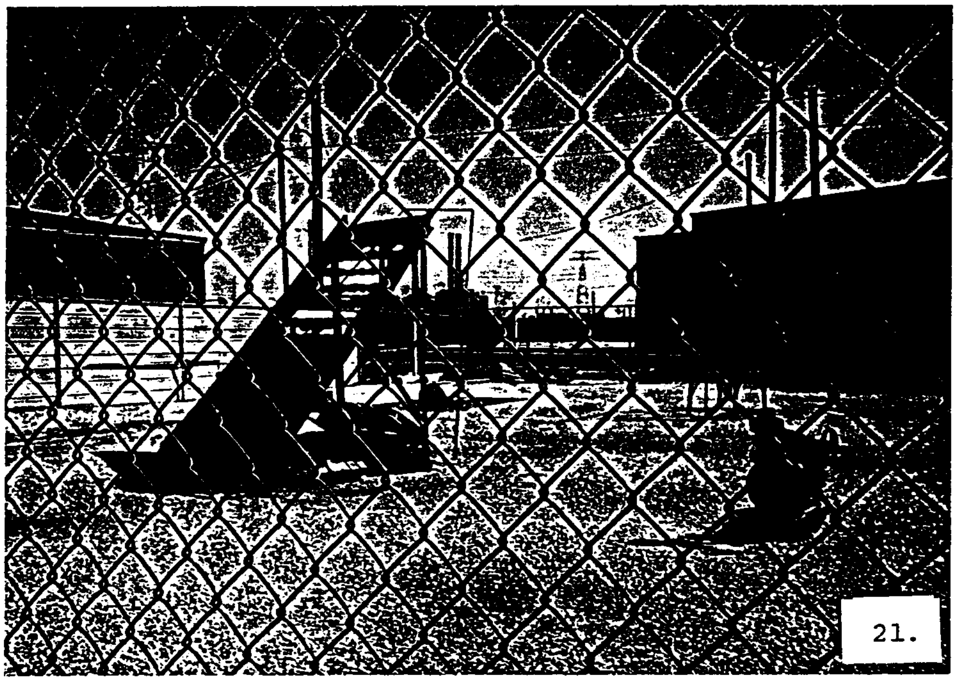
Location: Monsanto-Queen Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1130

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: South



PHOTOGRAPH NO. 21
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: Fire Training Area

Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1135

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: Northeast

PHOTOGRAPH NO.22
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: Tank Car Unloading Area

Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1150

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: North

PHOTOGRAPH NO. 23
OFFICIAL PHOTOGRAPH
JACOBS ENGINEERING GROUP

Subject: Azomethine Residue Holding Tank

Location: Monsanto-Queeny Plant, St. Louis, Missouri

Date: March 1, 1988 Time: 1150

Photographer: Carla Rellergert File No: 05-B667-00

Film: Kodak 200 ASA Witness: John Smith

Direction of Photograph: West